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VOLUME 124 — No. 8

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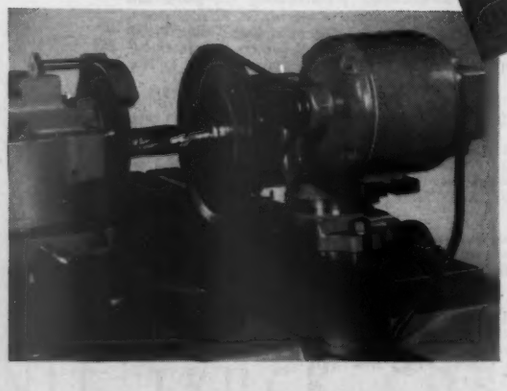

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RAILWAY Mechanical and Electrical Engineer

Mechanical Division Competition Conscious

Better service to patrons broad objective of program—Intensive research for refinement of details to continue

UNDERLYING the addresses and many of the committee reports at the twenty-fourth annual meeting of the Mechanical Division, A. A. R., held at the Congress Hotel, Chicago, June 26-28, inclusive, was evident a sense of urgency in adapting railway equipment and railway loading and operating practices to the strongly competitive situation in which the railroads must now make their way. The meeting was attended by approximately 700 railway officers and supply company representatives. The chairman of the Division, A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio, presided at all sessions.

Addresses

In the opening address, J. W. Barriger, president of the Chicago, Indianapolis & Louisville, said that the A. A. R. is the greatest single contributing factor in progress and the protection of railroads from burdens forced on them by unwise regulation. He emphasized the natural advantages railroads possess in mass transportation over long distances at high speeds, and said that this implies still more powerful locomotives, the maintenance of car and track conditions conducive to safety in high speed operation and drastic steps to minimize delays en route.

In his talk, J. H. Aydelott, vice-president, Operations and Maintenance Department, A. A. R., said that the past year had been a particularly difficult one for the mechanical departments because of conditions created by the coal and steel strikes which made it necessary to close many shops and because of the change in daily hours last fall. He congratulated them, however, for their share in bringing about increased safety, reflected in a reduction in the number of accidents to employees.

The railroads, he said, were in good condition to meet any demands for service, except in one respect: a shortage in the supply of freight cars. This, he said, is greatly to be regretted, because of the loss of revenue to the railroads which it represents and the failure to serve their patrons completely.

In looking ahead, he said that the railroads may have to change their minds with respect to the use of special types of freight cars. The shippers want them, he said, and their desires cannot be ignored.

E. H. Davidson, director, Bureau of Locomotive Inspection, I. C. C., explained that one primary requisite in connection with the safe use of Diesel motive power is cleanliness to reduce fires, accidents and all attendant costs. He referred to wheel failures and said that both railroads and manufacturers are giving much thought to improved inspection and maintenance practices which will tend to minimize wheel failures.

Mr. Davidson referred to the 34,000 steam locomotives still in service and said that there has been an increase in defects during the last six months, causing a number of so-called "minor accidents," which is a misnomer inasmuch as some of these accidents have resulted in permanent personal injuries. Mr. Davidson said that mechanical departments have done and are doing a fine job in reducing employee accidents. He referred to "cooperation" which must not be "a one-way street" and suggested that railway mechanical and transportation officers on all roads feel free to call on the Bureau of Locomotive Inspection at any time with the assurance that they will receive every practicable help in solving their mutual problems.

In an address on June 27, K. C. Underwood, president, Merchants Despatch Transportation Corporation, reviewed briefly the history of the Mechanical Division from the inception of the first code of interchange rules in 1864, forming of the Master Car Builders' Association in 1867 and the Arbitration Committee in 1887 with authority to hear arguments, develop facts without prejudice to either party and render decisions in disputes, thus making practicable the free interchange and movement of freight cars from one railroad to another throughout the country. He gave credit to this highly important and constructive work for the national unity, agricultural development and industrial progress which made the America of today.

Mr. Underwood said that times and conditions are changing and railroads must accept the facts of keener competition, increased taxes and other costs, offsetting these with better service, waste elimination, more efficient equipment and the use of improved designs and materials which will be less costly to maintain. He stated that individual railroads and private car companies depend on getting a fair break under the interchange rules and

A. K. Galloway,
Chairman

B. M. Brown
Vice-Chairman

V. R. Hawthorne,
Executive Vice-Chairman

F. Peronto,
Secretary

J. R. Jackson
Mech. Eng.

that the welfare of all roads hinges to a large extent upon how well the Mechanical Division does its work.

In his address as chairman Mr. Galloway said that railroads constitute the only 100 per cent common carrier required to carry whatever traffic is offered and prohibited from refusing business which is considered undesirable or unprofitable. He called attention to the fact that railroads carried 61.5 per cent of the ton-miles of freight traffic handled by all transportation agencies in 1949 and that mechanical departments spent $1,607,294,611 in 1949 for maintenance of equipment and other expenses or 18.7 cents of each dollar the railroads earned.

The railroads, he said, can no longer maintain equipment which is obsolete in design, requiring extensive expenditures for maintenance. Equipment today must be modern to meet competition and operate at speeds required to deliver goods of the shipper on schedule. The equipment must be safe in every respect to avoid damage and delays. The change in types of equipment requires changes in facilities, workmanship and efficiency.

He mentioned high points of the various committee activities and regarding research said, "The approved 1950 budget provided for a total of $127,101 to be expended by the Mechanical Research Office under 19 items. Outstanding activities have been the continuance of the cooperative research program covering road tests of freight trucks and snubbers wherein the equipment manufacturers pay for the testing of the devices entered. This program is in its third year and is to be extended into 1951 under a modified plan of procedure to be developed by the Research Office. Important progress has been made in the laboratory studies of journal-bearing design and lubricating materials and practices. Six progress reports covering field and laboratory tests of various projects have been issued by the Mechanical Research Office during the past year."

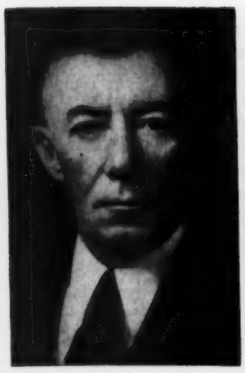
B. M. Brown, New Chairman

On the last day of the annual meeting, announcement was made of new officers-elect of the Mechanical Division. B. M. Brown, general superintendent of motive power, Southern Pacific, who served as vice-chairman of the division and actively participated in the proceedings, was elected chairman for a two-year term expiring in June, 1952. H. T. Cover, chief of motive power, Pennsylvania, was elected vice-chairman for the same period.

The terms of the following members of the General Committee expired in June, 1950, and as Sec. 5 (a) of the rules of order of the division provides that one-half of the General Committee shall be elected at one time, the following were elected to serve for a two-year term expiring June, 1952: A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio; R. G. Henley, general superintendent motive power, Norfolk & Western; J. P. Morris, general manager, mechanical department, Atchison, Topeka & Santa Fe; M. R. Brockman, assistant vice-president, Southern; J. F. Ryan, superintendent of machinery, Louisville & Nashville.

From the General Committee Report

As of December 31, 1949, 1,672,425 railroad-owned and 208,470 private-car-line cars—a total of 1,880,895 interchange freight cars—or 86.1 per cent, were equipped with AB brakes. This was an increase of 120,799 since December 31, 1948. In citing these figures the General Committee called attention to the latest order of the I.C.C. of October 10, 1949, which, in effect, requires that cars not equipped on December 31, 1949, if 2,000 or less in number, must all be equipped or withdrawn from interchange service on or before December 31, 1950, and where the number



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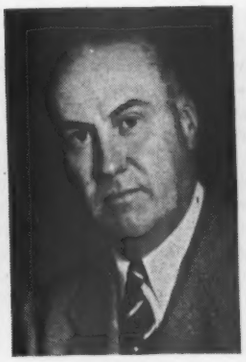
H. T. Cover



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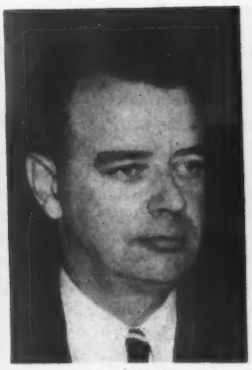


G. W. Bohannon

J. P. Morris

M. R. Brockman

A.A.R. Mechanical Division General Committee Members 1948-49

E. R. Battley

D. S. Neuhart

is over 2,000, one half must be equipped or withdrawn from interchange service on or before December 31, 1950, and the remainder on or before December 31, 1951.

Mechanical Inspection Department—This department has continued intensive checking of wheel-shop, air-brake maintenance, reclamation, and journal-box packing practices. It continues to give special attention to proper repairs to cars to insure going through to destination without intermediate shopping. Special consideration has also been given to compliance with Interchange Rule 2. The department will issue another of its annual reviews early in 1951 which the General Committee urges be brought to the attention of every interested mechanical-department representative so that rules and standards of the Division will be properly observed.

Refrigerator-Car Designs—Frozen-food refrigeration is on the Refrigerator Car Research Bureau's program for 1950-51. The study includes tests, both standing and road, to develop better ice nad salt proportions to secure lower commodity temperatures when transporting frozen foods. The road tests include three transcontinental trips and a series of short test trips between Chicago and New York.

Axle Ratings in Tender Service—In the 1947 report of the Committee on Locomotive Construction a procedure was recommended for calculating tender axle design in establishing loadings for the standard passenger-car axles when used under tenders which were approved by letter ballot. Specific wording was questioned by representatives of certain railroads and the matter held in abeyance for review by the Committee on Locomotive Construction and Committee on Axle and Crank-Pin Research. Certain revisions in the text have been proposed by these committees and approved by the General Committee, the principal effect of which has been to base the required axle size and vertical center of gravity corresponding to those of a tender carrying not less than 90 per cent of the full capacity of water and fuel rather than on exactly 90 per cent, as stated when adopted.

Coordinated Mechanical Associations—Attention is called by the General Committee to the fall meetings of the Coordinated Mechanical Associations—the Air Brake Association; Car Department Officers' Association; Electrical Section, Mechanical Division, A.A.R.; Locomotive Maintenance Officers' Association; Master Boiler Makers' Association, and Railway Fuel and Traveling Engineers' Association. They will meet September 18-20 at the Sherman Hotel, Chicago, except the Car Department Officers' Association which will meet at the Hotel LaSalle. An extensive exhibit of railway electrical equipment and appliances will be held at the Sherman Hotel. The General Committee recommends that the mechanical departments of the railroads allow as many of their supervisory officers as possible to attend these annual conventions and examine the exhibits in connection therewith.

Research Office—Effective March 1, 1950, the mechanical research staff moved to the new Central Research Laboratory located in the Technology Center, Illinois Institute of Technology, 3140 South Federal street, Chicago. Some of the research projects which are being carried on by the Mechanical Division are referred to by the committee. These are trucks for high-speed freight service; Indianapolis lubrication laboratory; journal-bearing development; brake-beam research; committee on relations between track and equipment, and axle and crank-pin research.

Passenger-Car Standardization—Under the direction of the board of directors of the Association, a joint committee of the Operating-Transportation Division and the Mechanical Division has been co-operating with a committee of the American Railway Car Institute in developing standard designs for passenger coaches, dining cars, lounge cars, parlor cars, observation cars, and baggage and express and mail cars. This pertains to the floor plan, location of bulkheads, lockers, window sizes, seat spacing, etc., leaving complete latitude to the purchasers as to interior furnishings, upholstery, coloring, etc. This project is rapidly nearing completion. Following its completion, similar action will be taken with respect to standardzation of sleeping cars.

Locomotive Construction

This year's report was presented in four sections: general, steam and electric locomotives, Diesel locomotives, and gas turbines.

The general section included recommendations for revision in the recommended practice for seamless steel couplings for screw-threaded pipe; standardization of roller bearing truck pedestal widths on locomotives and tenders; a progress report on the investigation with respect to the intensity of lateral forces on curved track and three items of steam locomotive boiler design—copper flue ferrules and the record of welded steam locomotive boilers. The report in conncetion with the latter item, noted that no additional welded boilers had been added in the year covered by the report. This section also includes a report on returns from a questionnaire on the seal welding of stay-bolts to firebox sheets and expressed the subcommittee's opinion that the practice has been sufficiently extended to warrant the formulation of definite recommendations.

Improved Progress for Steam Locomotives

A subcommittee selected to consider improvement and modernization programs for existing steam locomotives recognized that the economics involved in extensive modernization are such that the subcommittee considered it unwise to devote any great amount of time to the subject now. Included in the report, however, are references to several proposed items for economies in steam locomotive operation.

A recommendation was made that the work of the steam and electric locomotive section be expanded to include new subjects especially selected to fit the changing status of the steam locomotive. From a list of such subjects submitted, the following will be assigned to subcommittees for investigation and ultimate report: (1) Progress report on British and European steam locomotive development and practice; (2) Progress report on new developments with respect to steam locomotives, such as steam-turbine and turbo-electric; (3) Steam locomotive storage practice; (4) Oil-burning steam locomotives; (5) Spring and spring rigging design; (6) Coal combustion; (7) Smoke lifters; (8) Application of roller bearings to main and side rods; (9) Revision of recommended practice on multiple bearing crossheads; (10) Revision of recommended practice with respect to front end arrangement and (11) Steam boiler design and construction.

Diesel-Electric Locomotive Design

At the request of the Locomotive Maintenance Officers Association, a subcommittee has initiated a study of standardization of Diesel-electric locomotive parts. In commenting on the work the subcommittee made the statement that "many parts not involved in the basic design of the locomotive might easily have been standardized had builders been so minded. In some instances, an existing A.A.R. standard might well have been used either 'as is' or modified . . . . so that the railroads could be spared the confusion which now exists. It is undoubtedly true that the railroads themselves are equally responsible in that they . . . permitted unnecessary departure from recognized standards."

Standardization was considered in the report in the matter of trucks for 600- and 1,000-hp. switchers; couplers for Diesel-electric locomotives; cab arrangement; and location of air and steam-heat connections on road Diesels locomotives.

Fire Prevention on Diesel Locomotives

The committee continued contact with the Fire Protection and Insurance Section, and selected from a list submitted by the F.P.&I. representatives the following subjects for consideration by the Mechanical Division:

(1) Oil leaks, particularly from timing gear assembly.

This is a difficult problem on Diesel engines furnished by one of the principal builders, said the report, which added that the gaskets now in use contribute considerably to the problem since they deteriorate in stock due to shrinkage and brittleness which develops after a short period in storage. Even with more suitable gasket material a change in design of the seal is indicated to correct this matter satisfactorily.

(2) Leaky or faulty stacks which permit fumes and sparks to enter engine compartment.

This concerns an older type of Diesel engine furnished by one of the builders. One railroad has made correction by using a stainless steel ball joint between the exhaust manifold and the stack, while another railroad applied suitable baffles in the exhaust stack.

(3) Gear cases—poor design and fit resulting in loss of grease resulting in the accumulation of sludge and debris on the traction motors.

The matter of poor design referred to a new type of gear case furnished by one builder which pumped the grease out of the case. Its shortcomings were recognized and the faulty gear cases were replaced. Poor fit of gear cases, however, is a matter of maintenance and must be policed to prevent the loss of grease, which contributes to fire hazards underneath the locomotive.

(4) Accumulation of oil in sump underneath main generator.

The question raised concerned means for draining off the accumulation, and to facilitate cleaning. Two major railroads have devised means for draining the sumps but call attention to the need for care in running the drain pipes to avoid discharging the waste oil on top of fuel tanks, trucks, or on the steam pipes.

(5) Enclosure of decks underneath cabs to preclude accumulation of trash.

This refers to the space housing air reservoirs, brake valves, etc., as well as providing air intake for engine room ventilation. It is suggested that expanded metal screens be applied, and to facilitate cleaning that the space be properly lighted.

(6) Fuel tanks—can design be changed so as to suspend them directly beneath frame, thereby eliminating possibility of oil and trash accumulating thereon? Design must be such that there will be no oil draining from the deck to the top of tanks.

Suggestion was made that if all piping extending through deck of locomotive were fitted with flanged collars the seepage of oil to tops of tanks, trucks and steam lines would be minimized.

(7) Lubricating oil tanks and other appurtenances—can they be located to prevent pockets difficult to clean?

Change in design by manufacturer is needed to completely eliminate this problem, said the report. Some roads have corrected the situation by filling such voids and hidden or inaccessible pockets with car or floor cement, or a similar material.

(8) Elimination of false decks.

This referred to an earlier model furnished by one of the builders, which has been corrected on later designs.

(9) Steam cleaning of traction motors to remove grease and oil accumulation.

If properly carried out and steam is properly applied, with engine operating in fifth or sixth throttle position and all blowers on, no trouble should be experienced from moisture grounds in the traction motor.

(10) Location of air compressor to steam generator, resulting in compressor running hot, and space between compressor and generator difficult to clean.

This condition exists on one type of passenger locomotive only. The compressor has been relocated on later models. It has been the experience of some of the roads that hot compressors on this particular model have been the result of improper and faulty springs in relief valves, which has caused excessive operation and extreme pressures.

(11) Elimination of sharp corners where oil and sludge accumulate, the contour of which makes cleaning almost impossible.

This is something only the manufacturers can correct, and suggestion was made that this be incorporated in specifications for new units.

(12) Protection of cables under locomotives, particularly from chafing where they emerge from conduits and from oil leakage.

Some roads have corrected this deficiency by covering cables with neoprene jackets, which will take care of the first phase; the elimination of oil leaks as mentioned in other subjects should correct the last portion. However, it is believed that manufacturers should incorporate such protective coverings, and apply flanged collars where pipes lead through deck, in the locomotives when constructed.

Minimum requirements for fire protection on Diesel-electric locomotives were developed by a questionnaire and, after considering all conditions, the committee made definite recommendations as follows:

Passenger and freight locomotives: A unit cabs—one 20-lb. carbon dioxide or one 20- or 30-lb. dry chemical.

Passenger and freight locomotives: A and B units, in engine compartments—two 20-lb. carbon dioxide or two 20- or 30-lb. dry chemical.

Switchers, road: Two 20-lb. carbon dioxide or two 20- or 30-lb. dry chemical. (At least one extinguisher should be placed in the cab, and it would be preferred that both be located there.)

Switchers, yard: One 20-lb. carbon dioxide, or one 20-lb. or 30-lb. dry chemical.

Recommendations were made as to the character of fire protection equipment as follows:

(1) A bank of one or more 50-lb. carbon dioxide cylinders with hose or hoses sufficient to reach all parts of units on which installed. Hose or hoses should be located at doors so as to be accessible from outside; hose lengths can be shortened by piping carbon dioxide to outlets near doors. A horn shorter than the conventional horn can be used in the Diesel. To operate the carbon dioxide system hand pulls should be provided inside and outside the units. Carbon doixide from such a system, or separate carbon dioxide cylinders can be piped direct into electrical cabinets and generators, if desired. Valves, of course, are necessary. It is also possible to interconnect systems on the individual units of multi-unit locomotives.

(2) A mechanical foam system consisting of 50 gal. or more of pre-mixed foam with 1½ in. hose sufficient to reach all parts of unit (a desirable minimum is 100 ft.) and a foam playpipe, foam to be expelled by a 20-lb. carbon dioxide or nitrogen cylinder. An auxiliary connection to main air reservoir, with check valve and shut-off valve, is recommended. This extinguishing medium must not be used inside a unit unless the portable equipment has been exhausted, or the engine or engines have been shut down.

(3) A bank of one or more 140 lb. dry chemical cylinders with sufficient hose to reach all points on the unit. There is some question as to availability of space in the engine room for this equipment.

(4) Fire Detector or Alarm System for inside units: A few roads have installed systems for detecting fires in the engine rooms of units. These systems have merit in detecting a fire within the unit in its early stage which otherwise would gain appreciable headway, especially at night before discovery. These systems consist of fixed temperature thermostats above the engines, steam generators, compressor, etc., and also in the electrical cabinets, connected in series to an audible and a visual indicator such as a bell and a red light in the cab of the A unit. Temperature settings of thermostats vary with respect to location. The installation should be so arranged that it will not interfere with maintenance, or require to be disassembled if engines or generators are removed.

(5) Smoke Detector or Alarm System: Insofar as the committee is aware, two roads have installed this type of equipment for detecting under-carriage fires. These roads did not answer the questionnaire, and data on the practicability of this type of system are not available. The committee understands that such systems are somewhat susceptible to false alarms by reasons of roadside fires such as burning vegetation, crossties, etc. At this time the committee questions the feasibility or merits of such systems.

(6) Water Fog: This type of extinguishing equipment has its limitations on Diesel locomotives. The committee has no record of any system of this type having been installed. Its views on this type of equipment for Diesel-electric locomotives are that it has limitations which will have to be overcome before serious consideration can be given. These limitations consist of volume of water reserved for fire purposes only, and the method and cost of keeping it from freezing, if necessary. Water pressure required would be from an electric pump which could not be operated in event of power failure.

The report outlined the type of information that is being collected by the F. P. & I. Section with the idea of developing information on instructions pertaining to the use of fire fighting equipment; crank case cleaning; precautions with welding equipment; separation of battery leads and the use of a peep-sight for checking fuel oil drippings in the heating boiler. A table was included in the report summarizing the type of fire fighting equipment used on 58 roads.

A subcommittee appointed to investigate means for dealing with overheating of motor suspension bearings and armature shaft bearings reported that no device now exists which justifies a definite recommendation as to adequacy in carrying out the recommendations of the Interstate Commerce Commission. The committee is following developments with respect to new types of thermal alarms and wheel slip indicators.

Gas Turbine Locomotives

The concluding section of the report contained a progress report on gas turbine locomotive developments.

Since last year's report the Locomotive Development Committee of Bituminous Coal Research, Inc., has made considerable progress on the coal-fired gas turbine project.

A full-scale pilot plant, utilizing a Houdry gas turbine unit, has been in operation since November, 1949, at the Dunkirk, N. Y., works of the American Locomotive Company. This Houdry unit was loaned to the Locomotive Development Committee by the United States Bureau of Mines. This power plant has been fired with pulverized coal for 250 hours at an average combustion rate of 1,500 lb. of coal per hour. During this test period, a total of 375,000 lb. of coal was burned.

The Allis-Chalmers Company is currently completing the power plant intended for the first locomotive. This power plant, when completed, will be taken to Dunkirk and assembled with the other components which will go into the locomotive, and there given extensive load and cycling tests. It is expected that these tests will be completed by mid-December, 1950.

The tentative design indicates that it will be of two-unit construction, approximately 151 ft. 7 in. overall in length. Each unit will be carried on two 3-axle swivel trucks, will weigh approximately 384,000 lb. each, in loaded condition; and should develop 4,200 hp. at the generator at full load conditions.

Present plans call for the construction of one locomotive immediately upon the successful completion of the Dunkirk locomotive power plant tests. If the schedule is maintained as outlined, the Locomotive Development Committee should be able to demonstrate the coal-fired gas turbine locomotive in road tests during the year 1951.

General Electric Gas Turbine Locomotive.—The Alco-G.E. 4,500-hp. gas turbine locomotive was reported on by the subcommittee as follows:

Generally speaking, the performance of this locomotive has been satisfactory, particularly with respect to the basic design. No trouble has been experienced with the main turbine or axial flow compressor. Practically all trouble and delay have been attributable to breakage of fuel hoses, gages and gage lines, carbon on nozzles, testing of different designs of various accessories, and to the adjustment of smaller parts which could not be anticipated until the unit was operated in road service.

The cost of operation is comparable with a 4,500-hp. three-unit Diesel electric locomotive, except for fuel. During the periods that the gas turbine operated on Diesel fuel oil, the comparison was quite unfavorable. When operating on Bunker C oil, the comparison was better, due to the difference in the price of the two fuels. Because difficulties were experienced with combustion tube caps and liners, largely attributable to mechanical difficulties with the fuel system, it was necessary during the later part of the test period to increase turbine idling speed. This condition will be corrected by the installation of improved caps and liners.

Operation in tunnels has been satisfactory. Tests conducted in a tunnel 1⅛ miles long showed some rise in inlet temperatures to turbine compressor, but not sufficient to affect the horsepower output of the turbine. After standing still near the center of the tunnel, the recirculation of gases did not make it uncomfortable in the cab or engine room, and was considered less objectionable than in cabs of steam locomotives.

By the latter part of November, 1949, the gas turbine in the locomotive had operated approximately 2,300 hours, the majority on Bunker C fuel, and had accumulated a total of 27,863 miles, 17,928 of which were operated on the Union Pacific. At this stage, the locomotive was withdrawn from service, as General Electric desired completely to inspect the gas turbine power plant. During this inspection, a number of comparatively minor but essential modifications are being made. Inspection and modifications were scheduled for completion during the first quarter of 1950, and the locomotive will be returned to freight service on the Union Pacific.

Westinghouse Gas-Turbine Locomotive.—Installation is now

nearing completion on a Westinghouse 4,000-hp. gas turbine locomotive for passenger service.

Santa Fe-Baldwin Locomotive.—The basic design of the Santa Fe oil-fired gas turbine locomotive is the same as reported last year. The locomotive is being built by Baldwin and is rated at 3,750 shaft hp. This locomotive is a gas turbine being built by the Elliott Company and has been under tests. It is expected to be completed before the end of 1952.

Lima-Hamilton Gas Turbine.—The concluding portion of the report is a progress report on the Lima-Hamilton free piston gas turbine locomotive which is being built by Westinghouse Electric Corporation. Delivery of the power unit is expected in 1950.

The members of the committee are H. H. Lanning (chairman), mechanical engineer, Atchison, Topeka & Santa Fe—Steam and Electric Locomotive Section; C. H. Knowlton (vice-chairman), assistant engineer equipment, New York Central system; H. C. Wright, general superintendent motive power, Western Region, Pennsylvania; Frank Williams, chief mechanical engineer, Canadian National; D. R. Calleri, mechanical engineer, Southern Pacific; J. L. Ryan, mechanical engineer, St. Louis-San Francisco —Diesel Locomotive Section; A. G. Hoppe (vice-chairman), engineer research and development, Chicago, Milwaukee, St. Paul & Pacific; K. Cartwright, chief mechanical engineer, New York, New Haven & Hartford; G. F. Wiles, supervisor Diesel-electric locomotive operation, Baltimore & Ohio; H. V. Gill, superintendent shops, A. T. & S. F.; F. Thomas, assistant to general superintendent equipment, Diesel and electric, N. Y. C. system—Gas Turbine Locomotive Section; H. C. Wyatt (vice-chairman), assistant general superintendent motive power, Norfolk & Western; J. B. Blackburn, engineer motive power, Chesapeake & Ohio; J. L. Carver, mechanical and research engineer, Illinois Central; H. Rees, mechanical engineer, Union Pacific; and F. H. Einwaechter, chief engineer motive power and equipment, B. & O.

Discussion

H. H. Haupt, general superintendent of motive power, Central Region, Pennsylvania, said that the recommendations for engine and trailer truck lateral resistance pertained to the 4-8-4, and asked if these recommendations apply also to the 2-10-4 with the drive on the third axle rather than on the second axle. The reply was that the 2-10-4 was tested as a matter of interest because it was available. Recommendations, if made for the 2-10-4, would be somewhat similar to those for the 4-8-4 considering the No. 3 axle on the 4-8-4 equivalent to the No. 4 axle on the 2-10-4. However, no definite comparisons can be made.

W. I. Johnson, assistant mechanical engineer, Louisville & Nashville, was impressed with the committee's conclusion that, irrespective of any existing or contemplated degree of Diesel operation, many individual items of steam locomotive improvement will effect definite savings where a general improvement program may not be justified. As his management continues to Dieselize they are no longer prone to improve steam and will authorize only minor improvements costing $400 to $500 per locomotive at one time. Even this small amount, however, will pay off. Mr. Johnson believed in keeping modern steam power well maintained and up-to-date, and improving semi-modern locomotives.

One member mentioned that it would be worth while to work out a program for steam locomotive storage practice. The air craft industry had considerable trouble and expense storing planes until they worked out a program of recommended practices. Another member had trouble with cast steel crossheads cracking on 2-8-4's, the oldest of which was six years, and asked if any one had information on wrought steel crossheads to improve this situation. A member replied that his line had no difficulty from cracking using forged crossheads with detachable shoes.

A. G. Hoppe, engineer of research and development, Chicago, Milwaukee, St. Paul & Pacific, recalled that several years ago he advocated quitting the seal welding of staybolts and using an all welded bolt instead. The Milwaukee now has one locomotive equipped with 80 such bolts on one portion of one side sheet.

G. W. Bohannon, chief mechanical officer, Chicago & North Western, said that the C. & N. W. now has two Diesel-locomotive wheel-slip controllers in service, and that another is being considered which is on a different principle but is not yet fully developed. The matter of standardization of parts is exemplified by the difficulties that arose on pedestal openings. It was advocated that everything possible be done when new equipment is being developed to get the builder to conform to standards when in the pilot model stage before so much money has been spent that changes cannot be afforded.

H. V. Gill, superintendent shops, Atchison, Topeka & Santa Fe, said that 150 traction motors are being tested with different makes of roller bearings and that the railroads are still using overgrown street car motors. No improvement has been made in traction-motor gear cases, and either the builder should be required to redesign the cases or the railroads should build them themselves.

C. M. House, general superintendent motive power and car equipment, Gulf, Mobile & Ohio, emphasized the need for greater standardization of Diesel locomotive parts, uniform cab arrangements, fire prevention and good housekeeping. He outlined the G. M. & O. procedure for keeping Diesels clean and mentioned that certain cleaning operations are placed on the periodic maintenance forms.

T. T. Blickle, mechanical assistant, Atchison, Topeka & Santa Fe, said that the important problem on traction-motor armature bearings is to improve the present design, and that it is more beneficial to direct efforts toward this than it is to finding a device that will determine the failures, which device will, itself, require maintenance.

The gas-turbine section of the report, which covered developments up to April, was brought up to date. The Houdry unit has now accumulated 455 hr. of firing with coal, 205 of these hours during the last 18 working days. Two continuous runs have been made, one of 32 and one of 45 hr., and in neither instance was the shutdown forced. High combustion efficiency has been obtained and the turbine blades have held up. Two turbines are on order, one from Elliott, which is similar to the Santa Fe unit, and the other from Allis-Chalmers. The power plant will be able to use either coal or heavy oil. The completion date for the Santa Fe locomotive mentioned in the report as the end of 1952 was intended to read 1950, but the 1950 date has been extended.

J. M. Nicholson, director, Department of Research, Atchison, Topeka & Santa Fe, said that the three largest items of locomotive expense are fuel, carrying charges and maintenance, in that order. For the gas turbine to expand its use it must have an overall cost and reliability that compares favorably with present types of power units. Experimentation to use low-grade fuel oil has been developed to where it can be expected to reduce the fuel cost. Metals have been developed to where a working temperature of 1,350 degrees can be safely used, and experimentation is underway to develop materials that will permit still higher working temperatures which will further improve the efficiency of the gas turbine. Exhaust temperatures are high and development work is under way to utilize this waste heat for steam generation as well as for power generation by using a low-pressure turbine which offers possibilities of improved overall efficiency.

The report was accepted and referred to letter ballot.

Lubrication of Cars and Locomotives

A recommendation suggesting that a general three-inch flat spot be adopted as a condemning limit for all journal box wedges was not approved. A sub-committee, appointed to formulate an A. A. R. specification or an approved list of roller bearing greases, reported that one bearing manufacturer had approved a grease produced by seven lubricant manufacturers. Recommendations were submitted by four roller bearing manufacturers for a list of eleven lubricants specifying those best suited to a specific bearing. A tabulation of the analyses of the eleven roller bearing greases was included in the report.

The committee made a recommendation to the Arbitration Committee to modify passenger car Rule 7 making provision for a lubrication period for 90 days for passenger car roller bearings.

Journal Box Lids

The report included a list of journal box lids which have been submitted, tested, approved and awarded certificates of approval.

The report included a list of three packing retainer devices approved only for those railroads which may desire to use them.

Journal Box Lubricating Materials

The report included a record of the progress which has been made on the research program at the Indianapolis Lubrication Laboratory and contained a review of results to the date of this report as follows:

1. Relating to delivery of the oil to the journal and retention of the lubricant within the box, the waste constituent of the waste pack may vary between quite wide limits as to thread types and grades.
2. The rating of commercially available waste threads (woolen and mixed warns, cotton threads and other materials) should, therefore, apparently be based on first cost, balanced against mechanical characteristics and resistance to continued servicing and renovating.
3. Waste-pack displacements (thread risers and rolled packing) result from the characteristics of the oil adhering to the journal. The critical range is below freezing.
4. Fluidity and/or non-stickiness in the sub-zero range are the desirable characteristics of the oil for waste-pack lubrication under winter conditions.
5. Film thickness and/or toughness at the range above 250 deg. F. are essential to withstand the critical conditions of summer operation.

The committee concurred in a proposal to continue an exploration of the possibilities of the unit bearing-wedge design for collarless axles to replace the present steeple-back bearing and wedge along the following lines:

1. Progress the design of a sleeve type bottom window lubricated bearing-wedge unit in association with a modified pedestal type journal box, for application to passenger equipment cars.
2. Progress the design of a crown unit bearing-wedge for installation (preferably without change in the front and back openings) in the present conventional cast freight truck side frame, for application to freight equipment cars.
3. Install one or more axle sets of both (1) and (2) for road demonstrations and limited service tests under the A.S.F. five-car Service Laboratory during the 1950 Freight Truck and Snubber Research Program Road Tests under the direction of the A. A. R. Mechanical Research Office.
4. Amplify the investigation of the modified bearing units to include other than waste-pack lubrication and the base line lubricant as used during the exploratory test program.

Lubrication Manual

The committee does not feel that the suggested changes in the Lubrication Manual should be made until sufficient time has elapsed to enable the provisions contained in the manual to be given a fair trial.

The report was signed by R. E. Coughlin (chairman) chief metallurgist and engineer tests, C. & N. W.; E. H. Jenkins (vice-chairman), assistant general superintendent car equipment, Western Region, C. N. R.; E. C. Ellis, superintendent car department, C. & O.; A. J. Pichetto, general air brake engineer, I. C.; D. C. Davis, lubrication supervisor, A. T. & S. F.; M. A. Pinney, engineer of tests, P. R. R.; H. T. Rockwell, assistant engineer, N. Y. C.; M. A. Hansen, engineer of research, G. M. & O., and F. Fahland, research and standards engineer, U. P.

Discussion

A third service test has been made of journal-box closures since the report was written, and this test showed the packing to be almost like new.

J. R. Jackson, mechanical engineer, Mechanical Division, described some of the test work currently being done by the A. A. R. The second progress report covering the work at the Indianapolis Laboratory will be ready in a few days. He thought it entirely possible to get a truly all-year oil in new or renovated stocks. The four recommendations of the committee on the development of a solid-type journal-box assembly have already been put into effect. A 180-deg. bearing with a collarless axle has been run on the test train, the application being to a design of high-speed truck that gives good control of lateral and vertical shocks. It is evident that a separate wedge and bearing are not needed. The unit bearing-wedge, which is essentially an extension of the flat back bearing principle with material of the conventional bearing, assumed position with the collarless axle and it took violent action to dislodge it.

The report was accepted.

Hot Box Alarm Devices

The principal activity of the committee was to continue observations of a device undergoing road-service tests as installed in solid-bearing equipped passenger cars on the Pennsylvania. The 1948 and 1949 reports contained previous service records.

Four hot box alarm systems or devices were approved by the committee for road service demonstration. The service tests of the Minneapolis-Honeywell device was terminated as of October 25, 1949, at which date this equipment was removed and returned to the manufacturer at his request. On the same basis, the Union Switch & Signal Co.'s hot journal detector was removed from the P.R.R. Car No. 3788 on July 25, 1949. This equipment had been undergoing service tests since December, 1945. A second installation of the Union Switch & Signal Co.'s hot journal detector, installed on P.R.R. Car No. 4265 during February, 1947, was also removed at the manufacturer's request on June 16, 1949.

The following tabulation shows the results of the road service tests of the two devices continued in service from the date of the original application to March 31, 1950.

A summary of observations of the two devices still undergoing road service tests on the Pennsylvania covering the 12 month period between March 31, 1949, and March 31, 1950, was included in the report as Appendix A.

Road Service Experience.—The committee has again been furnished with the experience of the New York Central system during the past year with the Twin-Plex alarm now standard on all modern road locomotives, both passenger and freight and on more than 3,500 passenger cars on the New York Central system. Detailed reports covering their service record during the period March 1, 1949, to March 1, 1950, was shown in Appendix B.

The 1949 anual report noted that the Southern Pacific, after experimenting with the Journ-A-Larm system manufactured by Fenwal, Inc., had plans to install this equipment on a group of new passenger-equipment cars to be built during the past year.

A report covering the Southern Pacific's experience with the Fenwal Journ-A-Larm system as of May 10, 1950, as furnished by Mr. L. H. Sultan, a member of the committee, follows:

"Southern Pacific placed two new 'Shasta Daylight' trains in service between Oakland, Cal., and Portland, Ore., on July 10, 1949. Fourteen cars in each train are equipped with Fenwal Journ-A-Larm system, which was placed in operation when new train service was inaugurated. On August 2, 1949, alarm system was turned off due to false indications caused by broken conductors in the thermoswitch to truck cables, and also in the truck-to-car body cables.

"The manufacturer supplied new cables and the system was again placed in operation in February, 1950. One false alarm, cause unknown, has been experienced on these trains since then.

"In April, 1950, Journ-A-Larm systems on other cars operating in various trains have been placed in operation and no trouble was experienced except three false alarms, cause unknown. As of May 1st, 1950, eighty-nine cars, including sleepers, are operating on Southern Pacific with Journ-A-Larm System in operation.

"This system has provisions for discharging the air signal line and transmitting coded signals to the locomotive cab. This feature has not been utilized in tests thus far."

The members of the committee ore J. R. Jackson (chairman),

Alarm Equipment	Service Months	True Indications	False Alarms	Possible False Alarms	Failures	Equipment Defect
Pennsylvania Cartridge	46	12	16	1	3	28
Magnus Metal Twin Plex	40	0	1	1	3	1

mechanical engineer, Mechanical Division, A.A.R.; M. A. Pinney, engineer of tests, Pennsylvania; H. L. Holland, assistant mechanical engineer, Baltimore & Ohio; J. Stair, Jr., electrical engineer, P.R.R.; H. T. Rockwell, assistant engineer, New York Central system; and L. H. Sultan, electrical engineer, Sou. Pac.

Discussion

It was remarked that it is better to follow through on a large number of hot-box detectors than to have but a scattered few, as the crews in the latter case do not become familiar enough with the equipment to understand its indications.

H. W. Faus, engineer of locomotive equipment, New York Central, agrees with those who say that it is more important to eliminate hot boxes than it is to detect them after they occur, yet feels that it is nonetheless true that we are still having overheated bearings and that it is worth while to find a means of detecting them when they do occur. It may not be the ideal approach to the problem, but it is like bumper blocks. They are worth having even though air brakes are the desired method for stopping the train. He thought that no alarm would give satisfactory results if applied to only a few cars. It would be like using only few blue flags at one or two points on a large system; not enough people would be familiar with it. On one road only one car out of every 6,000 was equipped with each device. In three failures, the bearing was hot and an indication given, but no report was made as the crew did not understand the indication. In five failures investigated in which the hot box was detected by other means, the alarm had functioned in four, but was not reported.

The report was accepted.

Report of Committee on Tank Cars

During the year the committee was called upon to give consideration to a total of 390 dockets and applications for approval of designs, 143 of which covered materials and construction of 3,168 new shipping containers, for mounting on new cars or for replacement on existing cars.

Two applications covered the construction of five multiple unit cars to be used for the transportation of 15 Class I.C.C.-106A500 type one-ton containers each.

One application covered the construction of one Class LTA car to be used for the transportation of pulverized or granulated dry commodities.

Five applications covered the construction of nine new car structures on which would be mounted an equal number of existing tank car tanks.

One application covered the construction of an undisclosed number of 19,000-gal. capacity class I.C.C.-103-W tank cars for the transportation of oil.

Two hundred fifteen applications covered alterations in, additions to, or conversions and reconditioning of 3,127 existing tank cars or shipping containers. . . .

Q-187 Saran Rubber Lining

Upon recommendation of the committee, concurred in by the Bureau of Explosives, the Interstate Commerce Commission, on September 12, 1949, issued Special Permit No. 504 authorizing the equipping of two (2) Class I.C.C.-103-B tank car tanks and their appurtenances with Q-187 Saran rubber lining for service trials in the transportation of hydrochloric acid. This authorization requires owners or operators of the two cars on which these tanks will be mounted to make annual inspections of these linings and render reports as to their condition, accompanying the reports with a statement showing the number of loads transported and loaded and empty miles run by each car during the period being reported on.

The two cars with Q-187 Saran-lined tanks were placed in service: one on January 3, 1950, and the other on April 6, 1950.

Modification of I.C.C. Regulations

Upon recommendation of the committee, concurred in by the Bureau of Explosives, the Interstate Commerce Commission, by order dated January 23, 1950, amended the Regulations for Transportation of Explosives and Other Dangerous Articles at Sec. 73.31, Par. (g) note 2 and at Sec. 73.303, Par. (q) (1) Note 15, limiting the use until May 1, 1950, of ARA-IV and I.C.C.-104 tank cars, converted as prescribed and authorized by order of February 26, 1942, for the transportation of liquefied petroleum gas having vapor pressures not exceeding 65 p.s.i.g. at 105 deg. F.

The report was signed by L. R. Schuster (chairman), engineer car construction, S. P.; J. R. Hayden, superintendent car department, M.-K.-T.; H. S. Marsh, superintendent car department, M. P.; A. A. Ott, chief car inspector, P. R. R.; R. S. Venning, special engineer, C. & O.; F. J. Harris, mechanical engineer (Car), C. N. R.; J. J. Root, Jr., vice-president, Union Tank Car Company; R. T. Baldwin, secretary, The Chlorine Institute, Inc.; R. W. Thomas, manager, research and development, Phillips Petroleum Company; J. M. Dahlem, master car builder, Mid-Continent Petroleum Corporation; T. H. Caldwell, maintenance superintendent, The Dow Chemical Company.

One of 20 16,000-gal. Diesel-fuel-oil tank cars being built for the Canadian Pacific by the Canadian Car & Foundry Co. for transporting Diesel fuel to points on the road's lines where Diesel locomotives are used—The car is 53 ft. 11¼ in. in length

Report on Arbitration

During the year Case 1833 was decided. The principal changes recommended in the report follow. None was considered to necessitate submission to letter ballot.

Rule 2, Interpretation 5, was changed to recommend an increase of 50 per cent in charges for the use of a crane or derrick for transferring or adjusting lading.

The committee recommended that the effective dates for various requirements of Rule 3, as listed below, now set at January 1, 1951, be extended to January 1, 1952.

Section (a), Paragraph (6)—Air brake pipe clamps: "J" bolt type.

Section (a), Paragraph (7)—Air brake pipe clamps: "U" bolt type.

Section (b), Paragraph (7)—Brake levers: Metal badge plates.

Section (b), Paragraph (9)—Braking Power: Braking ratio.

Section (c), Paragraph (11)—Couplers having 5 x 7 inch shank.

Section (c), Paragraph (12)—Couplers, lock lift lever and toggle.

The matter of extension in effective date of requirement in Paragraph (a-4), and (t-3-b) and (t-3-f) of this rule was referred to the General Committee. The committee also recommended that the effective date of requirement for paragraph (u-4) be extended from Jan. 1, 1951, to Jan. 1, 1952, but that no further extension will be granted for this requirement. The committee also recommended modifications to the following paragraphs:

Proposed Form—(*b*) (*1-a*) Brake beams, former A. A. R. Standard No. 15, A. A. R. No. 3 or *A. A. R. Standard No. 18*, required on all cars built new between January 1, 1935, and January 1, 1951, and on all cars rebuilt between August 1, 1937, and January 1, 1951. In interchange.

Note—Cars equipped with hangerless type brake beams, used with "Unit" trucks, will be accepted in interchange.

(b) (1-b) Brake beams, A. A. R. Standard No. 18, required on all cars built new or rebuilt on or after January 1, 1951, *except that higher capacity beams may be used where braking conditions require them.* In interchange.

Note—New brake beams applied in repairs to any car on or after January 1, 1951, must be A. A. R. Standard No. 18 beams, *except where higher capacity beam is standard to car.*

The committee also recommended that the second note following Paragraph (b-1-b) be eliminated, and that Paragraph (h-4) be modified to clarify the intent; that the note following Section (t), Paragraph (2-b) be modified to prevent reapplication of questionable designs of truck side frames. Section (t), Paragraph (3-c) was recommended for modification for the same reason. The committee recommended the inclusion of I-section side frames in Section (t), Paragraphs (3-a), (3-b) and (3-d) as I-section side frames are as objectionable as T and L designs.

Under Rule 9, the committttee recommended that the note in the bracket opposite "A. A. R. Couplers, or parts thereof, R.&R.," be modified to exclude the type E-11-inch coupler as the information is not necessary with the application of this type of coupler. The following new requirement was recommended for addition to become effective August 1, 1950:

Proposed Form—For A. A. R. Standard No. 18 brake beams, show "A. A. R. 18" and Certificate of Approval number, both of which are cast or marked on strut.

The committee recommended that the eighth requirement of this rule be eliminated.

The words "rubber lining" in the third paragraph of Rule 16 were recommended to be changed to "rubber-lined" to clarify the intent.

The committee recommended the elimination of Items 1 and 2, Rule 17, in the table covering substitution of brake beams in this rule, in the next Supplement, because No. 2 beams are now prohibited repairs; that present Items 4, 6, 7, 8 and 9 in the table governing substitutions of brake beams be modified; that two new items be added, and that item references in same be renumbered effective Aug. 1, 1950, as shown in a table included in the report. Note 1 following the brake beam substitution table was recommended for modification effective Aug. 1, 1950, as follows:

Proposed Form—Note 1.—In case of handling line responsibility, when A. A. R. Standard No. 18, former A. A. R. Standard No. 15 or A. A. R No 3 beam is applied in place of lower class beam, charge for new or R S. S. & T. beam applied, and credit beam removed at its R. S. S. & T. value. *A. A. R. No. 3 beam applied in such cases shall be charged on basis of former A. A. R. Standard No. 15 beam.*

The following was added to Note 6: *Brake beams applied to cars built new or rebuilt on or after January 1, 1951, must be A. A. R. Standard No. 18 beams, except where higher capacity beam is standard to car.*

The committee recommended that Note 9 following the table covering substitutions of brake beams in this rule be modified, effective August 1, 1950, as follows:

Proposed Form—Note 9.—Former A. A. R. Standard No. 15, A. A. R. No. 3 or A. A. R. Standard No. 18 hanger type brake beams are permissible substitutes for hangerless type beams providing truck sides have brake hanger brackets cast integral therewith, *except when the hangerless type beam removed is A. A. R. Standard No. 18, the hanger type beam substituted must be A. A. R. Standard No. 18.*

The committee recommended that a new Note 10 be added following the table covering substitutions of brake beams in this rule, effective August 1, 1950, to read as follows:

Note 10.—Charge for new A. A. R. No. 2-plus, new former A. A. R. Standard No. 15, or new A. R. R. No. 3 brake beams applied on and after January 1, 1951, in replacement of such beams, must be rendered on basis of R. S. S. & T. beam.

The committee also recommended that Section (o) be modified effective Aug. 1, 1950, and Item 14 in the next supplement, both to include I-section side frames in the same group as the T and L designs. The committee recommended that new Item 19 be added effective Aug. 1, 1950, to read as follows (present items 19-21 to be renumbered 20-22): 19. Cast-iron wheels, 700 and 750 lb., single plate, non-bracketed, cast prior to 1938.

In Rule 20 the following words were recommended for deletion from the captions in Figs. 2 and 3: where welding or riveting facilities are not available. In Rule 23, I-section side frames were recommended included with T and L designs.

The word in parenthesis in the answer to Interpretation 3 of Rule 32 were recommended to be changed as follows: (to the extent *specified in Rule 4*).

For Rule 36, the committee recommended adding the following words at the end: *provided they are safely secured to such stakes or lading. Paper or cloth banners of size requiring supporting frames, metal or wooden banners with or without supporting frames, must be securely fastened by bolts, wires or bands.*

For Rule 60 the committee recommended that a new Note 6 be added following Section (1) of this rule, effective August 1, 1950, to read as follows:

Note 6.—When AB brakes are given periodic attention, the back cover of service portion must be reconditioned by use of manufacturer's reconditioning die (WAB Pc. No. 539262 or NYABCo. Pc. No. N-6885), or new design service portion back cover (WAB Pc. No. 95050 or NYABCo. Pc. No. C.V.-144) applied. In cases where service portion removed has new design back cover it should be replaced in kind.

For Rule 61, Section (a), the committee recommended that the word "periodic" be substituted for "periodical" in the first sentence, and that the last two sentences should read: *Slack adjusters, on cars so equipped, shall also be inspected and repaired when necessary.* Charge shall be confined to repairs or renewals of these details; no charge permissible for inspection. In Note 2, the upper limit for penetration should be changed from 325 to 335.

The second Rule 74 and the third note following the table in Rule 86 were recommended for elimination.

The following two paragraphs of Rule 98 were recommended to be changed as follows:

(c-2) *Proposed Form* (2) Double plate cast-iron wheels, or any design of cast-iron wheel without weight cast thereon or below nominal weight, or *S.P.N.B. cast-iron wheels cast prior to 1938*, regardless of condition, shall be credited as scrap at expense of car owner, except as provided in Rule 68, and in cases where one wheel is broken in derailment it will be credited as scrap at expense of handling line and the mate wheel, if undamaged, will be credited as scrap at expense of car owner. In

such case, notation "D.P.," "S.P.N.B.," "No Cast Weight" or "Below Nominal Weight" shall be shown on billing repair card to justify scrap credit.

(c-5) *Proposed Form* (5) Single plate non-bracketed cast-iron wheels (excluding the 650 lb. size), *cast in 1938 or subsequent thereto,* removed from service on account of owners defect on mate wheel or axle, which require dismounting, shall be credited at scrap value, regardless of condition.

Detailed cost changes were made in Rule 101 on account of approval of No. 18 brake beam as A. A. R. standard, and to provide charges and credit for the No. 18. Recommendation was made to include I-section side frames with the T and L group in Rule 104, and to add the following new note to Paragraph 1, Section B of Rule 112:

Note.—Caboose cars shall be settled for on reproduction cost basis, including all permanent equipment, but not including tools and supplies. Depreciation shall be computed at 3 per cent per annum (straight line basis) from date originally built, not to exceed 85 per cent of reproduction cost.

Caboose cars converted from other types of cars shall be settled for on basis of cost of reproducing the type of car destroyed or damaged, depreciated from date the original car was built new.

Notes 1 and 2, Paragraph 8, Section B were recommended for modification to provide special settlement for subsequent renewals of special protective coatings or rubber linings of tank cars in the same manner as the settlement for the initial application.

Passenger Car Rules

The committee recommended that the effective date of Paragraph (e) of Rule 2, with respect to equipping all-steel or steel underframe cars with cardboards or suitable receptacles for accommodation of defect and joint evidence cards, and effective date of Paragraph (f) covering the application of brake shoe spark shields to passenger train cars having underneath exposed wood parts over wheels, both requirements now being set at January 1, 1951, be extended to January 1, 1952, and that new Section (h) be added, effective August 1, 1950, to read as follows:

(*h*) *Passenger train cars built new or rebuilt on or after January 1, 1951, must be equipped with A. A. R. Standard Passenger Car Axles or Alternate Standard Tubular Axles. From owners.*

Modification of Rule 7, Paragraph (f-13) and note following, was recommended to discourage the application of Class C multiple-wear wrought-steel wheel in cars having braking on wheel treads. A new paragraph, (j) (2), was added to read:

(j) (2). *When stenciling indicates air brakes are due for cleaning within 30 days, brakes may be cleaned regardless of whether or not car requires other repairs.*

The committee recommended that Paragraphs (1) and (2) of Section (1) be modified by adding the following at the end: "Separate billing repair card is optional, as outlined in Freight Rule 9." The period for checking and lubricating grease-lubricated journal roller bearings in (2) was recommended for extension from 30 days to 90 days. The table of dimensions for tubular axles was recommended for transfer to Rule 86 of the Freight Code, and a new second note added to page 329 to read: For Alternate Standard tubular axle, see second table in Freight Rule 86.

Passenger Rule 9, Paragraph (g) (2), was recommended for modification to permit charging for internal combustion engine fuel furnished at intermediate terminals.

Members of the Committee on Arbitration are J. A. Deppe (Chairman), superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; G. E. McCoy (Vice-Chairman), assistant chief of car equipment, Canadian National; W. N. Messimer, general superintendent of equipment, Merchants Dispatch Transportation Corporation; H. M. Wood, assistant chief of motive power (car), Pennsylvania; J. J. Root, vice-president, Union Tank Car Company; M. F. Covert, general superintendent of equipment, General American Transportation Corporation; R. E. Baker, assistant general manager (mechanical), Boston & Maine, and R. D. Bryan, mechanical assistant, Atchison, Topeka & Santa Fe.

The report was accepted.

Report on Car Construction

Each year since 1936, the committee has included a statement of freight cars ordered during the preceding year. Sufficient detail is given in these statements to indicate the extent to which the members were following A. A. R. standardization.

[The committee here included three tables showing that, of 24,350 new house and hopper cars ordered, May 1, 1949, to April 30, 1950, all were A. A. R. design throughout or conforming thereto, including lightweight alloy steel to A. A. R. base dimensions and inside dimensions to meet specific conditions. Of 730 40-ton freight refrigerator cars, 100 were not A. A. R. standard. No standard designs of gondola, flat, stock, refrigerator (50 ton and 70 ton) and special cars have been requested or produced, but a truck center plate height of 25¾ in. has been largely adhered to. The report showed that of 31,781 of these cars, 93.92 per cent have 25¾ in. center plate height, the balance of the cars having this dimension ranging between 25 in. and 28½ in. The committee reviewed four new designs of freight cars during the year in accordance with I. C. C. Rule 3 and approved them for interchange service as follows: box car for use as mobile battery charging substation, Greenville Steel Car Company; car structure, including anchorage for 16,000 Imperial gallon tanks and contents, Canadian Pacific; reinforced underframe on car designed for transporting 15 one-ton containers, American Car and Foundry Company; underframe for TL-type tank car reinforced for the mounting of an existing tank built in 1929, North American Car Corporation.—EDITOR.]

Change in Design of Stock Car

Some time ago complaints were made to this Association by certain shippers' organizations with respect to losses in stock shipped in stock cars, allegedly due to the vertical space restrictions in the lower and upper decks of present designs of stock cars, etc.

This matter was extensively investigated by your Committee and a survey was made to determine the best possible design of stock car which would eliminate loss and damage from such causes.

It will be noted that present inside height of stock car specified in Plate 103 of Supplement to the Manual of Standard and Recommended Practice is 8 ft. 7½ in. A revised drawing has been prepared involving changes in dimensions for stock car, bringing the important dimensions in line with those to A. A. R. Standard Box Car Design. The inside height at eaves has been increased to 10 ft. and the distance over strikers as well as the distance between truck centers is changed to coincide with similar dimensions for the A. A. R. Standard Box Car.

It is recommended, as a letter ballot item, that the revised drawing, next attached, be adopted to replace present Plate 103 in the Supplement to the Manual of Standard and Recommended Practice.

[The committee here discussed at some length important work of the A. A. R. Refrigerator Car Research Bureau which now has under preparation seven reports on pallets, trucks, doors, floor racks, floor construction, loading and bracing and platform clearances.—EDITOR.]

Future designs of railroad cars providing for insulation must be approached either with the intention of preventing water vapor from entering the car structures, or if it is allowed to enter, to make provision for its easy transmission to either the inside or outside of the car where the water vapors may be condensed and drained away. Due to this condition and the delay promise of a solution to these problems, until the Spring of 1952 it would not seem to be practical to attempt the further standardization of the refrigerator car until that time.

At a joint committee meeting of the two supervising committees of the Refrigerator Car Research Bureau held on April 20 and 21, 1950, the following activities were outlined for 1950:

A number of reports and recommendations made by the Refrigerator Car Research Bureau are being currently studied by the supervising committees for disposition at a later date.

Two standing tests, one at New Orleans and one at San Bernardino, California, will be made on a number of test cars using salt on the ice in various proportions both in cars with and without air circulation. The results of these studies will

be applied to revise ice and salt methods now used in the transportation of frozen foods. Two transcontinental trips will be run using the new salt and ice proportions in an effort to lower commodity temperatures in transit.

One transcontinental trip will be run using various types of forced air circulation in refrigerator cars so as to determine the best method now available.

One transcontinental trip will be organized and run on fresh fruit to determine if certain icing stations can be eliminated without sacrificing the service.

Considerable time will be devoted to making a large number of short test runs between Chicago and New York accumulating data on the possible revision of icing rules looking towards sufficient ice in bunkers to protect commodities at destination. Suggestions on operating tests relative to ventilation and heater service with the associated problems were deferred until the next joint committee meeting to be held late in October.

The Refrigerator Car Research Bureau now has a laboratory in which most of their technical equipment is stored. This facility will provide for the maintenance and calibration of the instruments used by the Refrigerator Car Research bureau in their field tests. The Bureau is consulting with car line traffic representatives in an effort to prepare exhibits and testimony in defense of the ability of the lighter than heavily insulated cars to adequately protect frozen foods in transit.

[This part of the report, presented by sub-committee Chairman R. D. Bryan was followed by a discussion of steel sheathed boxcar designs, particularly alternate constructions which will provide a car as satisfactory generally as the present A. A. R. standard design and in some cases give added strength. Necessary drawings were submitted for addition to the Manual. This part of the report was presented by R. H. Graff. J. R. Jackson reported on the progress in testing trucks for high-speed freight service; also on side-frames, bolsters and helical springs.—EDITOR.]

When testing various spring groups in freight-car trucks equipped with built-in snubbing devices, it has developed that a clarification is necessary as to the credit to be given the snubbing device actuating spring when this spring actually helps support the load imposed on the bolster.

In order to evaluate this situation, the following note will be added to Manual Page D-38-1949—Freight Car Truck Springs, Recommended Groups for 2½, 3 1/16 and 3 11/16 Inch Travel Springs: Note.—Where auxiliary springs, used for actuating snubbing devices, actually support the bolster, they may be considered as load carrying springs and may be substituted for standard load-carrying springs to an extent not exceeding the load-carrying capacity of the auxiliary springs at the extreme worn condition of the friction device.—F. G. Moody, sub-committee chairman.

Waste Retainer Ribs in Journal Boxes

Application of integral waste retainer ribs was adopted as standard practice by letter ballot in 1943 and journal box drawings in the Manual were revised to incorporate the waste retainer ribs and notation added to indicate they were Standard Practice.

Integral type waste retainer ribs have helped to a considerable extent to keep the packing in position and prevent it from working up under the journal bearings. Several types of waste retaining devices in the nature of springs that can be readily inserted in journal boxes not having the integral waste retainer rib have been developed. Experience indicates that a far greater protection is provided with the spring type waste retainers.

The spring type waste retainer cannot be satisfactorily installed in journal boxes having waste retainer ribs, and in order to properly utilize the spring device it is necessary to remove the integral type waste retainer ribs.

Since an increasing number of member roads are extensively using the spring type waste retainer devices, the present standard integral type waste retainer ribs should be approved as an alternate standard rather than Standard.

(This part of the report was signed by J. McMullen, sub-committee chairman.)

Report of Subcommittee on Brake Beams

Up to the time this report was written, the following brake beam manufacturers have received certificate of approval from the A. A. R. covering brake beams which they submitted for test in the laboratory under the supervision of the A. A. R., and which were found to meet the latest A. A. R. specification for No. 18 beams: Davis Brake Beam Company, Beam No. 106; Buffalo Brake Beam Company, Beam No. 504; Chicago Railway Equipment Company, Beam No. 102; American Steel Foundries, Beam No. 501 and 503; Chicago Malleable Castings Company, Beam No. 102; Dominion Foundries & Steel, Ltd., Beam No. 503; Canadian Car & Foundry Company, Ltd., Beam No. 102.

Road service tests which were started in 1947 on the 8 different types of brake beams submitted by brake beam manufacturers versus A. A. R. No. 3 brake beam, are still being followed.

[The report here showed progress in A. A. R. road tests of brake beams. It also contained important recommendations regarding brake beam gauges. It was presented by L. H. Kueck, sub-committee chairman.]

Failure of Z-Section Center Sills

Reports of failures of A. A. R. Z-26 section center sills furnished by 33 selected railroads and 4 refrigerator car operators were carefully reviewed and tabulated on the attached two statements.

Statement No. 1* is a summary of all failures reported and statement No. 2* is a recapitulation showing the predominant number of failures at particular locations and the possible causes of these failures.

Review of statement No. 2 indicates that the majority of failures reported were caused by methods of attaching component parts to the center sill, also design of component parts.

Total of 309 failures were reported under Group 1 due to center sill cracking from rear of draft key slot to top of sill. All of these failures were reported on riveted type underframes.

Group 2 covers 222 failures, 218 of which were reported by one railroad on two groups of box cars built in 1940 and 1941. No sketches were furnished to show exact location of these failures; however, the description furnished would indicate fractures are progressing from the center sill top weld and since these failures are largely localized to the two groups of cars, it appears that the failures are due to poor welding practices or other causes in design which would contribute to these failures.

Group 3 covers 82 failures due to buckling of bottom sill flanges between bolsters. The majority of these failures occurred on hopper cars subjected to capacity loads and high impacts from switching movements on heavy grades in mine territories.

Group 4 covers 6 failures of center sill at oversolid stops back of bolster on Duryea type underframes.

Group 5 covers 6 failures due to center sills cracking back of bolster center filler.

These failures were all reported by one railroad and indications are that failures were due to the bolster top cover plate not extending over the center sill as provided for on plate 513.

Group 6 covers 12 failures of center sill due to crack developing at welded front draft lug. These failures were reported on same group of cars built in 1941 and failure occurred adjacent to weld at back edge of front draft lug. Weld in this area was made on inside of center sill where it would be difficult to provide a satisfactory weld and it is our opinion that improper welding was responsible for these failures.

Group 7 covers 170 failures of bolster top or bottom cover plates at or adjacent to center sill.

Majority of these failures occurred on cars without diagonal braces indicating bolsters should be designed for greater strength in the longitudinal direction with respect to center sill in order to offset the loss of resistance from the diagonal braces when cars are subjected to heavy impact forces.

This subject is continued on the docket for further study; also, it is proposed to include bolster failures, and at the conclusion of this study recommendations will be submitted by the sub-committee covering modifications required to correct failures of center sills and bolsters.—M. C. Haber, sub-committee chairman.

[The report here recommended an additional stock car designation, as follows: "SA"—Stock Car. A car for transportation of stock on the hoof (except horses and mules), equipped with roof, slatted sides and side doors and fixed double deck located sufficiently high to permit the loading of cattle on the lower deck. With or without feed and water troughs.—EDITOR.]

*Statements No. 1 and No. 2 not included in this abstract of the committee report owing to space limitations.

Letter Ballot Items

The following recommendations contained in this report are submitted for adoption by letter ballot of the members: That—

1. Plate 103 in the Supplement to the Manual of Standard and Recommended Practice be revised to provide for a design of double deck stock car with greater cubic capacity, per drawing submitted.

2. The present caption on Manual pages D-14 and D-15 be modified so as to change the waste retainer rib in journal boxes which was adopted in 1943 as standard, to alternate standard.

3. The following items under Section B of the Fusion Welding and Bronze Welding Limits and Regulations shown in Section L of the Manual be modified as indicated below:

(a) To permit no welding of cracks or fractures on tanks of riveted construction, but to permit welded repairs to tanks of welded construction under certain conditions.

(b) To permit welding of lugs of cast iron air brake reservoirs.

(c) To prohibit welding of Farlow cheek plates where section is broken out between key slots.

(d) To provide welding regulations for non-integral types of journal boxes based on the kind of metal of which constructed: cast steel, malleable iron, or cast iron.

(4) An additional A. A. R. Mechanical Designation be added to stock car types on Manual page L-16 to provide for a stock car with upper deck high enough to permit the loading of cattle on the lower deck without difficulty.

The report was signed by L. H. Kueck (chairman), assistant chief mechanical officer, M. P.; J. A. Gower (vice-chairman), assistant mechanical engineer, P. R. R.; R. B. Winship, mechanical engineer, C. P.; J. McMullen, consulting engineer, Erie; R. D. Bryan, mechanical assistant, A. T. & S. F.; R. H. Graff, assistant engineer, car equipment, N Y. C.; F. J. Herter, engineer car construction, C. & O.; H. L. Holland, assistant mechanical engineer, B. & O.; L. R. Schuster, engineer car construction, S. P.; M. C. Haber, general mechanical engineer, U. P.; F. G. Moody, superintendent car department, N. P., and K. H. Carpenter, superintendent car department, D. L. & W.

Discussion

N. T. Olson, chief mechanical engineer, Chicago & North Western, called attention to a number of details of car construction, differing slightly from A. A. R. standard construction and said, for example, that excellent results have been secured on this road during the last 13 years with 8,900 cars which have the long leg of the side sill angles horizontal instead of vertical; also utilizing enlarged gussets at door posts and side sills having the diagonal edges of gussets flanged; also having the heel of side sill reinforcements scarfed and welded for a distance of 12 in. on each side of each door post. He suggested that a coating of protective material be applied over the underframes of stock cars to give increased service life.

The report was accepted and referred to letter ballot.

Couplers and Draft Gears

Couplers

Master Gauges—The committee recommends that a set of master gauges designed by the Mechanical Committee of the Standard Coupler Manufacturers for checking for wear limits all standard maintenance and reclamation gauges and for checking tolerances on new gauges be submitted to letter ballot. If approved the gauges will be available by purchase from any of the standard coupler manufacturers. These gauges and the manner in which they are used are shown in Figs. 1 to 8, inclusive, in the report.

Reclaiming Type D Coupler Locks—The committee recommends for approval by letter ballot of the removal from Interchange Rule 23 and from Section C of the Manual, Page L-6, of the permission to reclaim and reinforce Type D lock legs by welding, which has been found uneconomical and undesirable from the standpoint of safety. The practice for reclaiming locks in these references will then be in harmony with that in Section C of the Manual, Page C-67.

Type E Shank Height Gauges—The Mechanical Committee of the Coupler Manufacturers has recommended and this committee has approved the "go" and "no go" gauges for the control of the height of the shank of E couplers during manufacture. This is in accordance with letter ballot action last year revising the Fundamentals of Design in Section C of the Manual, to show ¼ in. and ⅞ in. maximum for the space between the bottom of the striking casting and the top of the coupler shank.

Type H Tightlock Interference—Undesirable emergency brake applications are reported in freight trains hauled by Diesel-electric locomotives which have tightlock couplers. The cause is interference of the lower interlocking lug of the aligning wing pocket of the tightlock coupler with the air hose on the freight car below the angle-cock nipple when the locomotive is operating as a pusher and during dynamic braking. This condition is aggravated when the angle cock is located in the extreme outward position as shown on Page 28, Section E, of the Manual. The Mechanical Committee of the Standard Coupler Manufacturers is considering design changes for new couplers to eliminate the interference and a procedure for modifying existing couplers.

Type F Freight Coupler—The report announces the completion of the new interlocking coupler for freight service on the development of which the Mechanical Committee of the Standard Coupler Manufacturers, the Coupler and Draft Gear Committee and the Car Construction Committee have collaborated. The advantages are cited as complete vertical interlocking of coupler heads which resists jack-knifing and overturning in derailment, a minimum of free contour slack, longer contour life because of restricted vertical movement between mated couplers, increased strength, no slip-overs, and prevention of mated conventional coupler from dropping to the rail in case of a pull-out. A typical application, including the yoke, front follower and striking casting with flexible carrier is shown in the drawing (Fig. 10 of the report). The Type F coupler is provided with key slots for the present standard horizontal draft key. This facilitates temporary repairs with a standard rigid-shank Type E coupler and facilitates the application of the Type F coupler to new or rebuilt cars of standard construction. Six car sets have been applied; 10 more are on order; 250 car sets were authorized last year for trial service. The committee recommends trial applications.

Pitt Type Coupler—The committee is assembling information looking to the early prohibition of the use of obsolete Pitt type couplers in interchange passenger-train service. Its attention has been called to numerous break-in-twos because of the failure of couplers of this 40-year-old design, which are not more than 50 per cent as strong as the Type E and not more than 40 per cent as strong as the tightlock coupler.

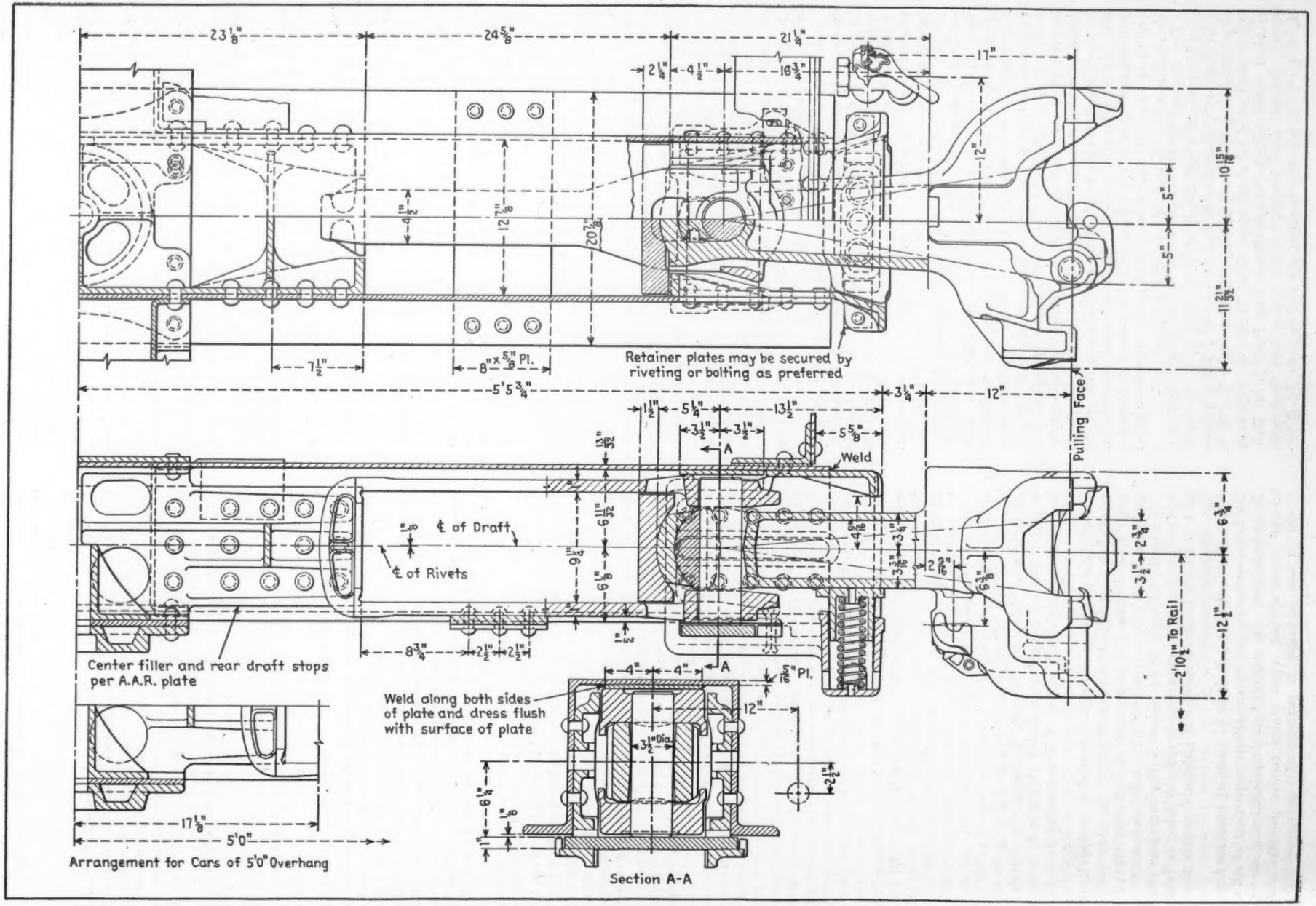
Progress Reports—Pusher tests have been completed simulating conditions under which derailments have occurred on the Pennsylvania when empty cars with swivel-shank couplers and swivel yokes or with swivel-shank couplers with swivel butts and Farlow two-key yokes are used in heavy pusher service. A report will be made in due course.

Internal redesign of the vertical guard arm of the Type H tightlock coupler has been made by the Mechanical Committee of the Standard Coupler Manufacturers to overcome vertical spreading of the guard arm to a degree that prevents intercoupling with another Type H. No weight has been added. Laboratory tests of the new design are in progress.

Draft Gears

Check Tests of New Canadian Gears—Specification tests of new draft gears manufactured in Canada disclosed some improvement in the manufacture of gears to which exceptions were taken as a result of the findings of the check tests made in 1944-45. Some deficiencies still exist and these are being called to the attention of the manufacturers concerned. A complete report is being submitted to the Canadian member roads.

Check Tests after Service—Detail results of check tests of certified draft gears removed from service after 5 and 12 years, now completed, are set forth in an appendix of the report. Tests of National type M-50B have been deferred because of the difficulty of obtaining specimens.


Retainer plates may be secured by riveting or bolting as preferred
Pulling Face
Weld
℄ of Draft
℄ of Rivets
Center filler and rear draft stops per A.A.R. plate
Weld along both sides of plate and dress flush with surface of plate
Arrangement for Cars of 5'0" Overhang
Section A-A

Typical application of the Type F interlocking coupler, including the yoke, front follower and striking casting with flexible carrier

Waugh Twin-Cushion Tests—The rubber elements of this gear were allowed to stand under constant compression in open air for a two-year period protected from the weather about as in a stored freight car. At the conclusion of this period the capacity and other characteristics of the gear were found by laboratory test to be practically the same as new.

Measurement of Draft-Gear Reaction—Agreement has been reached among the draft-gear manufacturers to co-operate in a series of exploratory tests at the A.A.R. Laboratory for the purpose of continuing the experiments conducted by the Edgewater Steel Company in co-operation with Purdue University at the A.A.R. Laboratory in an effort to find a simpler method of measuring draft-gear reaction than by double differentiation of chronograph curves. The Edgewater experiments were confined to the Edgewater draft gear but the results were such as to indicate the desirability of broadening the scope of the study to include other ypes of draft gear. The Edgewater experiments were referred to in the 1948 report of the committee.

Certified Draft Gears—During the year no additions have been made to the list of certified draft gears. Two new gears have been submitted for approval, one by a manufacturer who now holds a certificate for one gear and one by a manufacturer to whom no certificate of approval has yet been issued.

Short Draft Gears in Special Cars—The committee calls attention to the omission of a stipulation that the requirement that short draft gears for ore cars must be submitted to the Committee on Couplers and Draft Gears for approval before such cars are pemitted in interchange service was to apply only to new or rebuilt cars effective January 1, 1950. This was omitted from the third note to Paragraph (d) (1) of Interchange Rule 3, presumably by oversight.

Specification Change—Specifications for approved draft gears for freight service require that test specimens be selected from a lot of 50 gears to insure that they are representative of the average commercial product. In manufacturing 50 specimens the manufacturer does not usually make metal patterns but waits until a certificate of approval has been issued. The castings for the test gears are made from wood patterns and often require extensive grinding to fit production gauges. It is questionable whether castings produced from metal patterns with minimum grinding would fit as well as the specially handled pieces in the test specimens. As a further safeguard it is recommended that Paragraph 16 in Appendix A of Specification M-901 be revised to provide for an additional check of gear performance at some time near the end of the two-year service period under conditional certificate of approval, to be made on gears from the regular production line, before the conditional restrictions are removed.

Duryea Underframes—Car impact tests made in 1929 and 1931 showed the Duryea cushion underframe provided a good cushion for the car body against forces resulting from the impact of single cars, but that performance became less favorable as the number of cars increased. Only four cars could be used in these tests because the test plant would not accommodate a greater number. Comparative tests with trains of at least 100 cars and preferably 150 cars each were recommended by the Committee on Couplers and Draft Gears in 1931, 1932 and 1933. Similar recommendations were made by a Joint Sub-Committee on Draft-Gear Tests appointed by the Mechanical Advisory Committee of the Federal Co-ordinator of Transportation, in 1935. These tests were never authorized. During the past year a series of yard tests was proposed, using two trains of 100 cars each, one equipped with certified draft gears and the other with Duryea cushion underframes. The Sub-Committee on Draft Gears has been instructed by the General Committee to submit a detailed program for the tests and an estimate of the cost. This is now receiving attention. It is essential that the cars equipped with Duryea underframes and those equipped with friction draft gears otherwise be of identical construction and substantially the same age.

The members of the committee are H. W. Faus (chairman), engineer locomotive equipment, N. Y. C. System; C. K. Steins (vice-chairman), mechanical engineer, Penn.; F. T. James, general superintendent motive power and equipment, D. L. & W.; N. T. Olsen, chief mechanical engineer, C. & N. W.; B. Faughnan, assistant works manager, Angus Shops, Can. Pac.; J. W. Hawthorne, general superintendent motive power and equipment, A. C. L.; I. N. Moseley, research and test engineer, N. & W.; A. W. Maydahl, engineer car maintenance, U. P.; A. B. Lawson, mechanical engineer, B. & O.; L. R. Schuster, engineer car construction, Sou. Pac.

Discussion

K. L. Selby, chairman, Mechanical Committee of Standard Coupler Manufacturers, urged member roads to apply a few type H tightlock couplers to freight cars as past experience has indicated that some problems arise with new equipment and the experience with the trial number will be of value in handling large numbers. A pamphlet is available to railroads contemplating trial applications giving full directions.

The report was accepted and referred to letter ballot.

Brakes and Brake Equipment

Condemning Gauges for Used 1⅜-In. Hose Fittings.—The committee recommends for letter ballot action that the dimension of the "go" side used for condemning used 1⅜-in. air-hose fittings, as shown on Manual Page B-50A and B-50B be changed to conform to that of the new-fitting gauge shown on Manual page B-52 to prevent condemning new fittings with the used-fitting gauge. It is recommended that the dimension of the "go" side of the gauge for used fittings be changed from 1.723 diameter to read 1.724/1.726 diameter.

Hose Label and Bolting Clamps.—A new plate to be substituted for page E-17 of the Manual is proposed for letter-ballot consideration, for the purpose of clarifying the location of the clamp bolting lugs and also to show the coupling turned in the hose from the position now shown so that the date on the hose label will be in position to be more readily identified when the hose is applied to the car. If adopted, suitable changes in Interchange Rule 57 are requested. Notes have been eliminated from the proposed page B-17 as they are now covered in the specifications for the hose and the lower part of the page has been eliminated as the information on the Air Brake Hose Coupling Gasket is now on page 3 of Specification M602.

Freight-Car Slack Adjusters.—The committee is closely watching the development of automatic slack adjusters for freight cars and the tests being made of the various designs. The committee favors this development and, when satisfactory adjusters are developed, suggests that they eventually be made recommended practice for all freight-car installations. The following addition to Interchange Rule 61 (a) is recommended to insure proper maintenance of all types of slack adjusters: "Slack adjusters on cars so equipped shall also be inspected and repaired when necessary."

Gauges for AB Valves.—Difficulty has been experienced in the use of the gauges listed on Manual pages B-20G and B-20I because they do not enter their respective bushings far enough to permit gauging the point of greatest wear. They should only be used to determine the size of rings after the bushings have been trued up. Changes in the names to conform to this use on page B-20G are recommended for letter-ballot consideration, along with the omission of one gauge from page B-20I. In the revision of Instruction Pamphlet No. 2391 the words "preferably with a dial indicating gauge" were added at the end of the first sentence of the paragraph on page 9 for measuring gauge-bushing wear.

Passenger Retaining Valves.—Letter-ballot action is recommended on the proposed addition of lines to the tables on Manual page E-27 showing the proper size of orifice in the valve of passenger-car retainers used with HSC brake equipment.

Leakage on Freight Brake Systems.—The committee cites several circular letters issued in 1948 to 1950, inclusive, on difficulties with excessive freight brake-system leakage. It makes these further recommendations:

(a) That Interchange Rule 60 be modified, effective August 1, 1950, to require all back covers of service portions of AB valves be reconditioned with manufacturers' reconditioning die or new design covers applied, when brakes receive periodic attention.

(b) It was necessary to redesign the emergency ball-check

cover by adding a shroud around it to hold the gasket in place.

(c) That Rule 60 be modified, by letter-ballot action, effective January 1, 1951, to require that the new style emergency ball-check cover be applied when the AB valves receive periodic attention.

(d) Service tests are being conducted on new gasket designs to provide a better seal in the gasket groove of hose couplings.

(e) That there must be complete compliance with Rule 101 of the Rules for Maintenance of Air Brake and Air Signal Equipment if brake system leakage is to be reduced.

Manual Revisions.—Revisions of Manual pages E-11, E-12 and E-15, Air Brakes, General Arrangement and Details—Standard, and pages E-15 and E-16, Air Brakes, General Arrangement and Details—Recommended Practice, are proposed. These involve some additional material, the removal of some material now in the existing pages, and considerable rearrangement and consolidation. Some items are advanced from Recommended Practice to Standard.

Information and Work in Progress

Revision of the rules governing the maintenance of brake and and Instruction Pamphlet No. 5039-4, Supplement 1, is ready for distribution by the air-brake manufacturers.

Improved ABLC brake equipment with compensating valve and brake-cylinder sealed has been installed on 398 of the 400 Illinois Central cars which have the load compensating brake. To date, no difficulties have been reported. A circular letter will be issued shortly to indicate the car numbers and the handling to be given these Illinois Central cars on other roads in the event of failures.

Revision of the rules governing the maintenance of brake and train air-signal equipment is being actively progressed with the Interstate Commerce Commission, Bureau of Safety. The committee hopes to present completed copies to the General Committee for approval soon.

Investigation of the operation of devices for checking electric circuits on trains with electro-pneumatic brakes is under way looking toward preparation of a progress report.

Revision of A. A. R. Specification 2518—Installation of AB Freight Brake Equipment will soon be completed, after which copies can be procured from the air-brake manufacturers.

The committee recommends that all freight cars offered in interchange equipped with special quick-changing type brake-cylinder release valve be of the new QRR type with check valve to connect to the retainer pipe.

The members of the committee are J. P. Lantelme (chairman), general foreman, Penn.; H. I. Tramblie (vice-chairman), air-brake engineer, C. B. & Q.; R. J. Dewsbury, general air-brake inspector, Chesapeake district, C. & O.; R. N. Booker, general air-brake inspector, Sou. Pac.; W. D. Bowser, engineer air brakes and train-control design, U. P.; D. R. Collins, superintendent air brakes, D. & R. G. W.; F. T. McClure, supervisor air brakes, A. T. & S. F.; A. J. Pichetto, general air-brake engineer, Ill. Cen.; L. D. Hays, engineer brake equipment, N. Y. C. System; R. G. Webb, superintendent air brakes, C. M. St. P. & P.; C. C. Maynard, chief inspector, air brakes, Can. Nat'l.

Discussion

The discussion was almost entirely directed to the subject of brake-system leakage on freight cars and, particularly, to the importance of renewing certain gaskets in AB brake valves at periodic cleaning dates. This was started by representatives of northern roads, on which winters are severe: R. E. Baker, assistant general manager, Boston & Maine; R. G. Webb, superintendent air brakes, Chicago, Milwaukee, St. Paul & Pacific, and F. G. Moody, superintendent car department, Northern Pacific. All three stressed the importance of strict adherence to the committee's recommendations and to Rule 101 of the Rules for Maintenance of Air Brake and Air Signal Equipment. When roads in other territories fail to do this, they are making it difficult for the northern roads to operate during extremely cold weather. If all roads made the in-date tests called for by Rule 101 whenever cars are on repair tracks and brake-system leakage were reduced to 2 lb. per min., it was the opinion that the situation would be greatly improved.

Mr. Webb said that the warping of AB covers was the result of reusing gaskets when new ones were difficult to get during the war. The gaskets became hard and attempts to make them tight distorted the covers. Mr. Moody hoped the change of ball check and service back covers would be made mandatory. He felt that if it was necessary to use the wrench frequently to keep the covers tight, the labor for repairing the present covers would be wasted. It was pointed out by H. I. Tramblie, air brake engineer, Chicago, Burlington & Quincy, that not all leakage is at the AB valve and it is necessary to reduce leaks on cars in service. For this purpose C. B. & Q. inspectors and repairmen are furnished special wrenches which cover the sizes of bolts and connections in the air-brake system, so that leaks can be corrected immediately they are found.

F. K. Mitchell, manager equipment, New York Central System, said the railroads had invested half a billion dollars in AB brake equipment and that the equipment is not satisfactory. Now the manufacturers furnish tools to restore AB valve covers so that it can happen all over again. In his opinion the manufacturer should furnish replacement parts without cost to the railroads.

A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio, supported this view, saying that, if the manufacturers could not get suitable materials during the war, they should have discontinued furnishing AB brakes. Not having done this, he thought they should share responsibility for the present situation.

C. D. Stewart, vice-president (engineering), Westinghouse Air Brake Company, called upon to answer, said that this was a highly controversial question on which he hoped the railroads and the manufacturers might get together in a sincere effort to arrive at a fair conclusion. In defense of the brake companies, he cited the fact that no damage to AB valve covers was experienced for the first eleven or twelve years after the brake was made mandatory in 1933, and that during this period, up to January 1, 1942, approximately one-half of the freight cars were equipped with the AB brake. Gaskets that are thirteen or fourteen years old, he said, had been found still in service in AB valves. During the war, he said, it became impossible to get natural rubber for gaskets and time has proved that the synthetic rubber is not as resilient as the natural rubber. He recalled that the period between servicings of K triple valves was thirteen and fifteen months; the AB valves go for three years, and if gaskets are good at the end of two periods, they will be nine years old before being removed. The service back cover, he said, was considered strong enough, but it was later decided to stiffen it, even though there were a return to rubber gaskets.

He cited an instance at Mandan, N. D., last January, at 20° below zero, indicating that AB valves are not the only source of leakage, when tightening hose and angle cocks and renewing gaskets in hose couplings brought the caboose pressure on the end of an 80-car train to within 5 lb. of that on the locomotive.

The report was accepted and submitted to letter ballot.

Geared Hand Brakes

A. A. R. certificates of approval have been issued for 28 types of geared hand brakes—15 vertical wheel types, 10 horizontal wheel types and 3 lever types. These are shown in an accompanying table.

In order to clarify the test requirements of specimens of geared hand brakes submitted for A. A. R. approval, the committee recommended changes to Manual pages E-61 to E-64-F. The report included the test code for approval certificate for geared hand brakes outlining in detail the procedure for both vertical and horizontal wheel hand brakes and for the lever type hand brakes.

Specifications for Repairs and Reclamation

Some roads, having questioned the necessity for testing reclaimed geared hand brakes in the same manner as the procedure followed for certification tests of new hand brakes, the committee, after investigation, recommended the elimination of that requirement and the amplification of the bench test. The recommendation, a letter ballot proposal, would eliminate Manual pages E-96-A to E-96-F and revise Manual pages E-95 and E-96.

GEARED HAND BRAKES FOR WHICH CERTIFICATES OF APPROVAL HAVE BEEN ISSUED

	Number by Types		
	Vertical wheel	Horizontal wheel	Lever type
Ajax Hand Brake Co.	1	..	..
Amer. Car & Fdy. Co.	..	1	..
Canadian Cardwell Co., Ltd.	..	1	..
Klasing Hand Brake Co.	2	..	1
Superior Hand Brake Co.	1	3	..
The Orme Co. (Champion Brake Div.)	2	..	..
Union Asbestos & Rubber Co. (Equipment Specialties Div.)	1	1	1
Union Railway Equipment Co.	1	1	..
Universal Railway Devices Co.	4	2	1
W. H. Miner, Inc.	1	..	..
Total	14	8	3

The sub-heading of the list of A. A. R. approved types of geared hand brakes in Interchange Rule 101 has been changed to include reference showing type designation on the housing.

Certificate of approval will be revised to cover the substitution of a pressed wheel housing and back plate on universal vertical wheel hand brake, Type 5-705.

The report also carried reference to replacement hand wheel for vertical wheel brakes and a foot operated geared brake.

Injuries to Employees

Further joint consideration of injuries to employees referred to in the 1949 report with the Committee on Train Service Accidents and the Engineering Committee of the Gear Hand Brake Manufacturers has resulted in an agreement which is outlined in detail in the report with respect to (1) Uniformity of application; (2) Uniformity of ease of release; (3) Non-spin wheel; (4) Standardization of bell crank; (5) Uniform length of brake chain; (6) Vertical location of brake step on box cars and (7) Proposed education program.

The members of the committee are E. P. Moses (chairman), engineer car equipment, N. Y. C. System; J. P. Lantelme, general foreman, Penn.; H. L. Holland, assistant mechanical engineer, B. & O.; R. G. Webb, superintendent air brakes, C. M. St. P. & P.; J. R. Jackson, mechanical engineer, Mechanical Division, A. A. R.

The report was accepted.

Wheels

Corrections were made to Fig. 8, page 3, Supplement 1 to the Wheel & Axle Manual eliminating the note referring to turning off 5/16-in. of the black collar. The report included a table of standard axle dimensions making dimensions *C* and *D* the same for standard and tubular axles thus preventing the use of the wrong gage.

Revisions were made to Manual page G-2B-1950, Specifications M-403-48 and a recommendation was made that the former condemning limits for cast iron wheels of 80,000 lb. capacity and over be re-established to provide that wheels under cars shall be removed with flange having flat vertical surface extending 7/8 in. or more from tread, or having flange 1 1/16 in. thick or less, gaged at a point 3/8 in. above tread, instead of the present condemning limits for these defects, which are now set at 1 in., in both instances. It will be necessary that the flange limit remount gage for remounting all cast iron and cast steel wheels as shown on Manual page B-45, also cuts shown as left-hand portions of Fig. 106 of Wheel & Axle Manual and Fig. 7, page 167, of the current Interchange Rules, be changed to provide 1 3/16 in. openings, instead of 1 1/8 in. openings now shown. Also, it will be necessary to change the present 1 in. opening in the regular wheel gage, page 75, Fig. 7, of Wheel & Axle Manual, and page 155, Fig. 1, of current Interchange Rules, to provide 1 1/16 in. opening.

Changes were recommended in Specification M-107-48 to conform to changed service conditions and changes in the Class A wheel specification.

The investigation of the relation of wheel failures to hot stamp markings on Diesel locomotive wheels is to be continued.

The special committee on prevention of steel wheel failures under Diesel locomotives and passenger cars reported that a questionnaire will be sent to 33 roads and a report on the results presented next year.

Nicked Axles

The nicking of axles, on journals and between wheel seats has reached such proportions that the committee urged that action be taken. As most of the damage is being done in loading and transporting mounted wheels, due to the type of wheel car being used and to lack of proper maintenance of such cars, it was decided to request the Car Construction Committee to develop designs of cars for transportation of mounted wheels used in various classes of service, including wheels used in various classes of service, including wheels having Budd disc brakes, roller bearing wheels, Diesel locomotive wheels, locomotive tender, engine truck and trailer wheels, with the understanding that such designs be submitted to the Wheel Committee for approval before being approved as Standard or Recommended Practice.

It also was decided to request the Committee on Loading Rules to carefully review, improve and bring up-to-date the present figures in the Loading Rules for the shipment of mounted wheels of all types.

These subjects have been placed on the dockets of the committees involved, for consideration.

It was agreed that the best results would be obtained by the use of cars having buckets or receptacles or what are sometimes called well-type cars, which would hold mounted wheels securely in position and not permit wheel flanges to contact any part of axle of adjacent pairs of wheels.

The report recommended that this matter be progressed as rapidly as possible, and after a fixed future date a check should be made by A. A. R. mechanical inspectors to aid in securing uniform handling of wheels in transit.

Hub Wall Thickness

The committee has considered a suggestion that the minimum hub wall thickness of wrought steel wheels be decreased from the present specified 1 1/8 in. to 1 in. in order to economize in the use of such wheels. The committee recommended, as a letter ballot item, that 1 in. minimum hub wall thickness be specified for wheels used on Classes A, B, C, and D axles and that 1 1/8 in. minimum hub wall thickness be specified for wheels used on Classes E and F axles. If this recommendation is approved by letter ballot, the committee will arrange to make the necessary changes on the design sheets shown in Section G of the Manual of Standard and Recommended Practice.

Hub Design of Wrought Steel Wheels

The committee recommended, as a letter ballot item, that wrought steel wheel design C-33 (Manual page G-35) be changed to show dimensions 0_1 and 0_2 as $9\frac{3}{4} + 1 - 0$ in. and maximum finished bore as 7 3/4 in., in order to be consistent with wheel seat diameter specified for passenger car axle on which these wheels are used in some head end service.

As information, an error has been noted in dimensions for hub wall diameter of design A-36 wrought steel wheel shown on Manual page G-47. The hub diameter dimensions 01—02 are specified as $9\frac{1}{2} + 1 - 0$ in. and maximum finished bore as 7 1/4 in. In order that these dimensions may be consistent with wheel seat diameter for 5 1/2 by 10 in. passenger car axles, the committee held it in order to editorially correct dimensions 0_1—0_2 to show $9\frac{3}{4} - 1 - 0$ in. and maximum finished bore as 7 3/4 in. and it is suggested the secretary arrange to make these editorial corrections with the next set of revised and additional Manual pages.

The report also contained extensive detailed recommendations for editorial corrections to be made in Section B of the Manual with respect to master gages; gages for new one-wear and new cast iron wheels and alternate cylindrical tread wheel gages.

Editorial corrections were noted in the Wheel & Axle Manual with reference to built-up treads on wrought steel wheels; failure of axles due to use of gas torches; and wheels that have been damaged in fire.

The appendix of the report outlined revisions which are

to be made on pages 201 and 206 of the Manual, Section XX.

The report concluded with the notation of the addition of Section XXI to the revised edition of the Wheel & Axle Manual.

The members of the committee are E. E. Chapman (chairman), mechanical assistant, Atchison, Topeka & Santa Fe; H. H. Haupt (vice-chairman), general superintendent motive power, Central Region, Pennsylvania; I. N. Moseley, research and test engineer, Norfolk & Western; A. M. Johnsen, engineer of tests, Pullman Company; M. S. Riegel, assistant engineer test, New York Central system; R. W. Seniff, engineer of tests, Baltimore & Ohio; P. V. Garin, engineer of tests, Southern Pacific; B. C. Gunnell, chief mechanical engineer, Southern; H. E. Wagner, superintendent car department, Alton & Southern; G. A. Harstad, foundry metallurgist, Chicago, Milwaukee, St. Paul & Pacific.

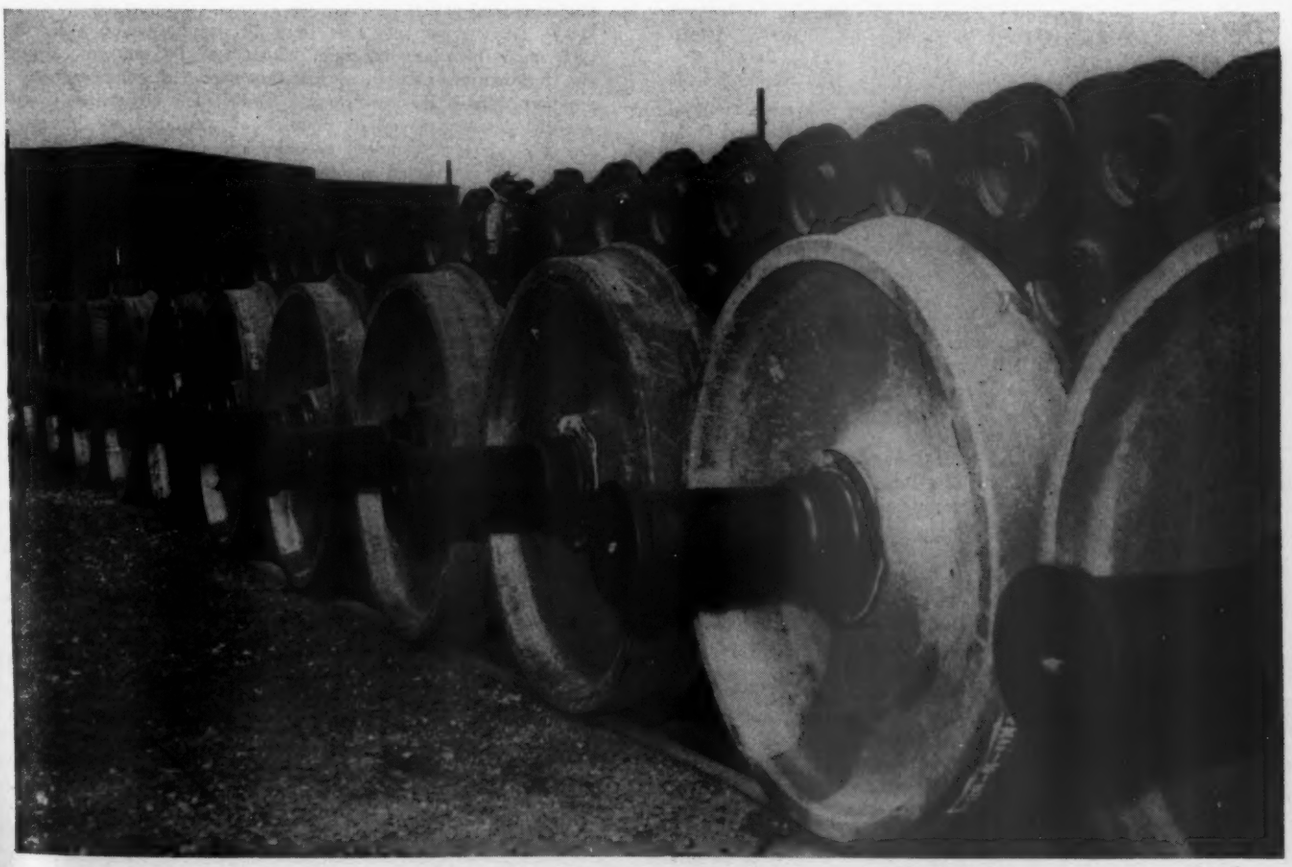
Discussion

Three changes were made in the report. The manufacture of wheels for Diesel locomotives without marking was sanctioned, but not for interchange, and this was accepted by a vote of the members present. The new paragraph 50 for addition to page 52 in the revised edition of the Wheel and Axle Manual was referred for further study because there is some objection to accepting any wheels which had been in a fire. A typographical error was corrected in the report by changing Fig. 7 to Fig. 73 as on Page 75 of the Manual.

C. B. Bryant, chief engineer, Technical Board of the Wrought Steel Wheel Industry, said that the action on wheel marking indicates concern over wheels in Diesel locomotive service. As neither the A. A. R. nor the I. C. C. kept records of this type he compiled some statistics. The first instances of failures were reported in 1946. The present marking has been in effect for years and on millions of wheels. As far as is known, no failure from marking has ever occurred under steam locomotives, passenger or freight cars; all have been on Diesels. Thirty-six Diesel wheels have been found cracked, 15 on inspection and 21 in service. This is out of over 80,000 wheels during a four-year period. All were in freight, helper or switcher service, none in passenger. Two roads in heavy grade territory accounted for 23 of the failures. All showed signs of having been overheated, some perhaps by the hand brake. One road had 12 failures in 1946 and 1947, but none in 1948 or 1949. It is not known how the trouble was stopped. Failures do not occur under passenger cars with tougher braking requirements, nor under tenders with heavier wheel loads. From this it might be suspected that the failures are due to the high tractive force of the Diesel. Mr. Bryant felt that the wheels should be marked in some place, perhaps on the hub face as a greater hazard could arise from getting a wrong class of wheel on a locomotive than the marking would incur. Adopting gauges for one-wear wrought-steel wheels should increase the life. In the past it was necessary to take off flange metal, and flange wear frequently causes removal.

C. M. Stoner, executive vice-president, Association of Manufacturers of Chilled Car Wheels, commented on the new chilled wheel design. With the hub section cored out this has been approved as standard effective September 1, 1950, and approval has been given to an alternate design having a solid hub. Practically all of the wheel manufacturers will be fully equipped to make the cored hub wheel by the effective date but it will be necessary for some manufacturers to furnish at least some present standard wheels for a few months longer to those railroads which will insist on the solid-hub design. The proposed change to the rules on wear limit for chilled-wheel flanges results in an increase of 1/16 in. in minimum flange thickness and a reduction in maximum vertical flange height from 1 in. to 7/8 in. While

* * *



Wheels for a small number of the total freight cars ordered in connection with the Union Pacific's $23,000,000 freight-car-building and purchase program—The railroad's car shops at Omaha, Neb., Grand Island and Denver, Colo., are turning out a total of 2,500 box cars and 500 stock cars

this proposal might be considered as indicating an increase in chilled-wheel flange failures, this is not the case. On the contrary, as shown by the figures in the committee report, there was a sharp decrease in flange failures during 1949. However, there are indications of an increase in the proportion of thin and vertical flanges involved. This condition is not general throughout the country, but has been more in the form of epidemics on individual railroads. The effect on wheel life should not be serious. Present removals of chilled wheels for worn or vertical flanges amount to about 5 per cent by the condemning and remount rules combined. This will undoubtedly increase, particularly during the first year, but since the number of wheels will be relatively small and since they will also be pretty well worn toward the condemning limit for tread wear, the change would hardly have a measurable effect on overall wheel life. Furthermore these additional wheels removed will be a group in which the incidence of flange failures is apparently quite high.

D. A. Reavis, general foreman, car department, Nashville, Chattanooga & St. Louis, stated that for the period from August through November a total of 49 flange failures were found on his road, and that wheels are often kept in service beyond their economical life. Other roads are having the same trouble. Eight other roads were written to and three said they had this difficulty. One of the other five delivered to the N. C. & St. L. four cars with broken flanges within two months. He thought that all roads should keep records on broken or chipped flanges.

B. M. Brown, general superintendent motive power, Southern Pacific, said that there remains much to be done on passenger-car steel wheels. The road kept accurate records of steel-wheel removals and found thermal cracks to be one big trouble.

A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio, said that very little additional wear is gained from the final turning on multiple-wear wheels.

The report was accepted and referred to letter ballot.

Prices for Labor and Materials

The committee has continued the work of analyzing material, labor and new equipment costs in A. A. R. Interchange Rules 98, 101, 107, 111 and 112 of the Freight Car Code, and Rules 21 and 22 of the Passenger Car Code. [Detailed tables of price revisions were included with the report for all of these rules except Rule 111.—Editor.]

All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1950, quotations submitted by the purchasing agents of the ten selected railroads, representing 39 per cent of the total freight-car ownership in the United States and Canada, showing a mixed trend in material markets. Item 142-A was eliminated on account of it being no longer permissible to apply U-type coupler cross-key retainer to foreign cars. Item 142-B was modified to indicate that the T-type coupler cross-key retainer is no longer an A. A. R. standard.

Modifications to Rule 107 were: Item 42 to indicate charge covers the retainer, or lock, or both; Items 95 and 96 to include plywood and to indicate types of securement intended, and Items 141 and 142 to include plywood.

No modifications were recommended to Rule 111.

Recommendations were made to Rule 112 regarding reproduction pound prices of new freight cars of all classes, in order that Supplement of August 1, 1950, may reflect 1949 costs. New prices recommended are based on cost of 58,897 freight cars constructed during 1949.

In Passenger Car Rule 21, Items 16, 20-F, 20-G, 20-K, 20-L and 20-M were modified to indicate charges cover all type brakes.

Material price quotations under Passenger Rule 22 were rechecked on the basis of quotations as of March 1, 1950, showing a slight upward trend, with the exception of service metal on wrought-steel wheels which reflects a slight decrease brought about by increase in scrap prices. Note 1 following Item 41-A was modified to clarify the intent. Note 6 following Item 63 was modified to require passenger type brake beams removed account defective to be held and promptly reported to car owner for disposition.

Time studies are being made by a special subcommittee covering periodic attention to AB and AB-1-B types, U-type, and D-22 type air-brake equipment. When time studies are completed, and if the results justify modification of existing allowances or the addition of new items, such changes or additions will be made.

The committee intends to investigate labor and material costs again in October and, if sufficient change develops, necessary revisions will be made and inserted in the Rules, effective January 1, 1951.

Members of the committee are T. J. Boring (chairman), general foreman, M. C. B. Clearing House, Penn.; P. F. Spangler (vice-chairman), assistant superintendent motive power, St. L.-S. F.; J. D. Rezner, superintendent car department, C. B. & Q.; L. B. George, assistant chief motive power and rolling stock, Can. Pac.; G. J. Flanagan, general car inspector, N. Y. C.; J. J. Root, Jr., vice-president, Union Tank Car Company; A. H. Gaebler, superintendent car department, General American Transportation Corporation, and G. R. Anderson, superintendent car department, C. & N. W.

The report was accepted.

Specifications for Materials

The committee recommended that revisions be made, or that new specifications be adopted, for the following numbered items and submitted to letter ballot: M-108, M-110, M-111, M-120, M-504, M-505, M-506, M-507, M-611, M-612, M-615, M-616, M-912 and M-915. M-101 was corrected to clarify the meaning of the words "as forged." Under M-115, the question of the tensile test specimen for firebox steel, and the matter of copper limitation in A. A. R. specifications, were continued on the docket. A specification for steel with both a maximum and a minimum carbon limit for brake shoe keys under M-116 was assigned for study. An editorial change was made in M-124 to clarify the intent. The grade of malleable iron for railroad castings, specification M-402, has become available from 38 suppliers, and a list has been made of these suppliers which will be sent on request. The Lubrication Committee has recommended consideration of a winter thinner for new car oil, M-906. The committee is canvassing members to obtain copies of available specifications, and will write a proposed specification and submit it for approval. The committee assigned to a subchairman the subject of writing a proposed specification for locomotive sand.

General

The study of Diesel crankcase oil by the subcommittee referred to in the 1949 report indicates that successful completion of a proposed specification for compatible Diesel heavy duty type lubricating oil for railroad locomotives will require a research program conducted by the railroads similar to the former programs for lubricating oils meeting the requirements of Army series 2-104-B and the Navy series 9000 oil. It is the belief of the members of the specification committee that the railroad engine builders and oil refiners can be induced to take part in this test work through the Coordinating Research Council of the Society of Automotive Engineers and the American Petroleum Institute.

To engage in such research work will entail some out-of-pocket expense and a small liaison group will be appointed from the specifications committee to approach the Coordinating Research Council to determine the extent to which they would cooperate in a proposed project of this kind.

Studies of the effect of residual alloys on carbon firebox and boiler steels representing 28 fireboxes and 19 boiler steels referred to in the 1949 report were completed and attached to the report as information.

The committee consists of W. F. Collins (chairman), engineer of tests, New York Central System; P. H. Smith (vice-chairman), engineer of tests, Chicago, Burlington & Quincy; H. G. Burnham, engineer of tests, Northern Pacific; M. A. Pinney, engineer of tests, Pennsylvania; R. W. Seniff, engineer of tests, Baltimore & Ohio; E. B. Fields, engineer of tests, Atchison, Topeka & Santa Fe; R. McBrian, engineer standards and research, Denver & Rio Grande Western; L. S. Crane, engineer of tests, Southern, and

G. E. Baumgardner, assistant research engineer, Norfolk & Western.

The report was accepted and referred to letter ballot.

Safety Appliances

In co-operation with the Committee on Brakes and Brake Equipment the committee followed the service performance of the ABLC brake equipment installed on 398 lightweight hopper cars of the Illinois Central. Early investigation developed that the ABLC brake was not functioning as designed and intended. Certain changes in design have been made by the manufacturers and improved devices installed. Representatives of the air-brake manufacturers made a joint inspection of 40 cars equipped with modified ABLC brakes and furnished a report covering this inspection which is being studied by the interested committees. When development work has been completed and the operation of the brake has received full approval, proper specifications and suitable operating rules will be submitted to the member roads for letter ballot approval.

The Sixteenth Edition (1950) of United States Safety Appliances has just been published, with the approval of the I.C.C. The principal change in the revised edition is the addition of a new note to page 105 to cover the last two orders issued by the I.C.C. on the application of AB brakes to cars used in interchange service.

A revised issue of Maintenance of Air Brake and Air Signal Equipment on Locomotives and Cars (last revised in 1941) will be published. Everything is ready with the exception of one rule on which negotiations are being conducted with the I.C.C.

Applications for approval of three new designs of metal running boards have been revised, but to date all of the requirements have not been met by any of the applicants. The committee approved a proposed revision by the Committee on Car Construction of the test requirements on metal running boards to clarify the present static test and to incorporate provisions for a torsion test. It was recommended as a letter ballot proposition that the last paragraph of Section 3-Manufacture, contained in Specifications for Running Boards Other Than Wood, for Box Cars, Other Roofed Cars, and Tank Cars, Manual page C-25B, be so modified.

Members of the committee are R. G. Henley (chairman), general superintendent motive power, N. & W.; H. T. Cover, chief motive power, Penn.; G. W. Bohannon, chief mechanical officer, C. & N. W.; F. K. Mitchell, manager of equipment, N. Y. C. System; J. M. Nicholson, director, department of research, A. T. & S. F.; A. K. Galloway, general superintendent motive power and equipment, B. & O.

The report was accepted.

Loading Rules

Soon after the start of World War II shippers, in general, and particularly the basic industries, became extremely conscious of the importance of following the published loading rules for commodities loaded on open-top cars, in order to insure prompt and safe delivery of their shipments. However, objections were raised to the large size of the rule book; they pointed out that it contained loading methods for commodities in which individual shippers in many cases had no interest.

Claims had been made by various groups of shippers that the loading rules would receive much wider distribution among the shippers if they were published in pamphlet form. At the time separate pamphlets were being published for War Department vehicles, ordnance materiel, machinery, and other items. These pamphlets were widely distributed and met with instant favor.

One group of shippers started to publish in a pamphlet of their own only such rules as were applicable to their industry, which met with great favor.

The Association has now come to the point where similar demands have been filed. In order to satisfy the various groups of shippers and at the same time assure a wider distribution, all future loading rules will be issued in pamphlet form.

The first of the new pamphlets containing a complete set of rules for the loading of Grading and Road Making Machinery was issued in February of this year. The second of the series, covering Steel Products (excluding pipe) is nearing completion and will be issued sometime in July of this year. Additional pamphlets covering the following commodities will be issued as soon as possible: wrought iron and steel pipe; forest products; machinery; miscellaneous commodities; farm equipment machinery.

The report on revisions of the rules is in two parts. Section A contains all completed items scheduled for inclusion in the rules, and Section B, the subjects still under consideration.

Section A

General rules:—Changes in Rules 10, 15 and 19-A.

Lumber, poles, logs, etc.:—Nine specifications revised, including one drawing.

Flat rolled steel:—Two specifications revised.

Coil sheet steel:—Two specifications revised.

Wrought-iron and steel pipe, boilers and tanks:—Twelve specifications, including three drawings revised. Four new specifications and drawings developed. Two drawings deleted.

Mounted car wheels:—One revised specification and drawing.

Crawlers, tractors and road rollers:—Seven revised specifications, including four revised drawings; two new specifications and drawings, and two drawings deleted.

The reasons for the changes were predominantly to satisfy shippers; 26 changes were made at the request of shippers, eight to clarify the intent of the rules, and four to increase safety.

Section B

Approximately 26 subjects are still under consideration, some of which will require only revisions in the present specifications and figures, while others will require the formulation of new specifications and figures.

1 on Forest Products	Poles
11 on Steel Products	Girders; Sheets; Rails; Pipes; Tanks
2 on Machinery	Revision of Machinery Supplement; Power Units
5 on Farm Machinery	Gas Type Engines; Threshers; Combines; Hay Balers; Tractors
4 on Stone and Clay Products	Stone; Marble; Pouring Channels; Sewer Pipe
1 on Automotive Products	Trailers
2 on Electrical Equipment	Transformers; Carbon Electrodes

The preparation of specifications and drawings to be included in the pamphlets for Forest Products; Steel; Pipe and Farm Equipment Machinery is under way.

The revision of the Machinery Supplement is being held in abeyance pending a joint conference with the Operating-Transportation Division to co-ordinate certain details pertaining both to open and closed car loading and will be issued in the near future.

The other open subjects will be included in the published rules upon completion.

The members of the committee are M. B. Moir (chairman), chief car inspector, Penn.; H. H. Golden (vice-chairman), supervisor A.A.R. Interchange & Accounting, L. & N.; T. W. Carr, assistant to superintendent of equipment, P. & L. E.; A. H. Keys, superintendent car department, B. & O.; H. S. Keppelman, superintendent car department, Reading; F. A. Shoulty, assistant superintendent car department, C.M. St.P. & P.; H. J. Oliver, assistant superintendent motive power, D.T. & I.; G. R. Andersen, superintendent car department, C. & N.W.; L. T. Donovan, assistant to executive vice-chairman, Mechanical Division, A.A.R.; H. L. Hewing, superintendent interchange, Chicago Car Interchange Bureau; N. A. Williams, assistant engineer freight-car design, U.P.; L. F. Delventhal, Jr., transportation inspector, West. Pac.

Discussion

Plowman, vice-president, traffic, United States Steel Corporation, in a prepared discussion, commented on the tremendous progress which had been made in the last two years toward greater

safety and more effectively competitive loading methods. Working together, the Loading Rules Committee and the shippers are coming to a better understanding of mutual problems. Over half of the drawings and specifications of the Loading Rules, he said, deal with steel and steel pipe, which makes co-operation a matter of importance to both industries. The steel industry, he said, likes the new form of the rules in pamphlets, each containing the rules affecting the loading of products of a single industry.

He commented on the trend toward the development of methods of loading which produce a floating load. Such loads, he said, are practical and effective, while rigid loads are being made obsolete by present freight-train speeds. He referred to the cushion underframe of the type included in the General American-Evans car, which is to be further tested by the Mechanical Division, as being worthy of study as a possible answer to this problem. Trucks, he reminded his audience, now provide a floating load on the highway, and require much less dunnage.

In closing the discussion, Chairman Moir said changes in the rules during the coming year would look toward reducing the expense to the shipper.

The report was accepted.

Special Committee On Lumber Loading

No joint meetings have been held with the shippers during the past year, it being possible to dispose of all matters by correspondence or through the Special subcommittees consisting of railroad men located in lumber loading districts.

A meeting of the committee was held in January of this year at which time certain Fig. 6 revisions were approved, as follows:

1. Where the top half or third of the pile is tied into two or three side by side packages, individually tied with ties as specified under Item G, and completely fills all space between Items B, additional Items G, tying the two or three side by side top packages into one unit, are not required.

2. Lumber used on top of load to protect it from the elements must be secured in a complete unit so as to prevent it from becoming disarranged or dislodged. It must be secured by Items G, when they are used, or by two similar ties encircling all lumber above the top separators when Items G are not used.

With the development of packaged loading of lumber on open top cars, there is a demand for a rule that will permit loading in the most economical manner and at the same time provide adequate protection while shipments are enroute. Some of the carriers have been accepting shipments of packaged lumber on open top cars which did not comply with all of the requirements of Figs. 6, 6-A or 6-B of the A. A. R. Loading Rules. As a result, a considerable amount of difficulty has been experienced in the handling because of shifting which occurred due to the improper or inadequate securement.

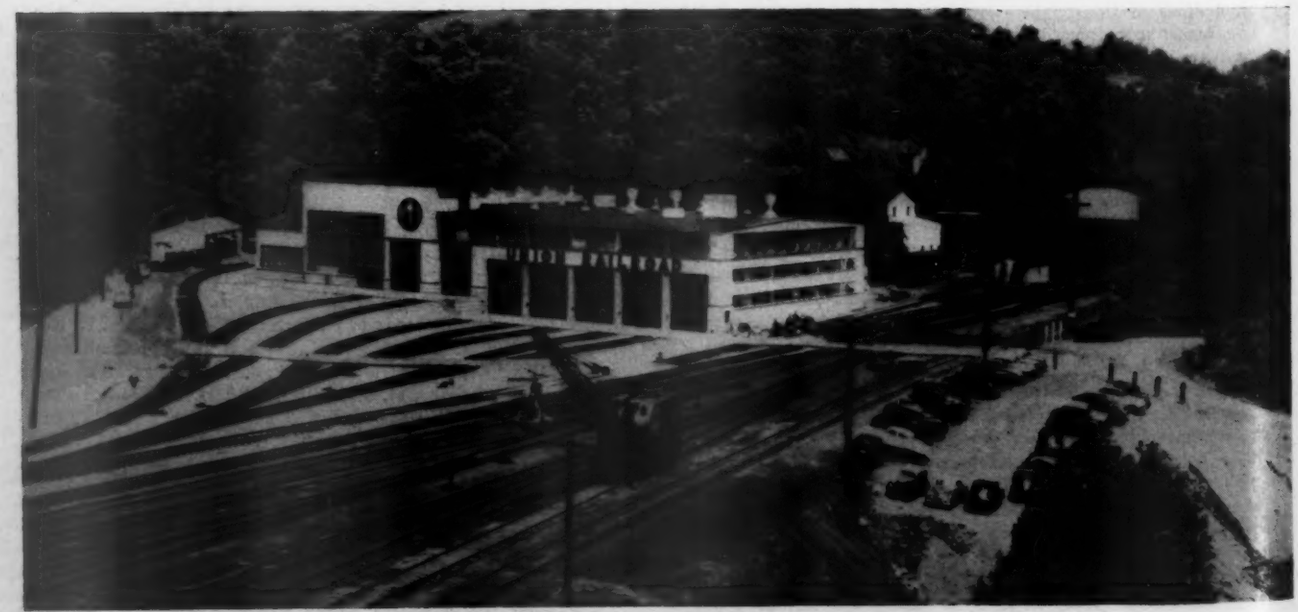
Experimental shipments of packaged lumber have been moving from points in the South to various destinations throughout the country in good condition. Recently, the movement of test shipments of lumber in side by side packages has been authorized under Test No. 344 to shippers in the Pacific Northwest. These loadings are being supervised by members of an "On the Ground" subcommittee. There are no objections on the part of the Committee to the shipping of packaged lumber under new methods of loading on an experimental basis. We will welcome any opportunity to conduct or authorize further tests of packaged lumber loaded on open top cars. The carriers can greatly assist the committee in this respect.

Due to the saving in time incurred with shipments prepared for mechanical loading and unloading, the trend among receivers is for packaged loading. There are no objections, of course, to the practice of tying lumber into bundles provided the method of loading otherwise meets all of the requirements as set forth in the Open Top Loading Rules. It is agreed that where facilities for loading and unloading are available, packaged loading greatly facilitates the operation. It is with this thought in mind that your Committee is proceeding with experiments of variously tied shipments, to determine which methods are most satisfactory. It is hoped that specifications and drawings for one or two methods of loading packaged lumber can be incorporated in the rules in the near future.

The report was signed by F. A. Shoulty (chairman), assistant superintendent car department, C. M., St. P. & P.; N. A. Williams, assistant engineer, freight car design, U. P.; G. R. Anderson, superintendent car department, C. & N. W.; G. J. Lehnerer, superintendent car department, I. C.; L. E. Day, district master car repairer, S. P.; F. G. Moody, superintendent car department, N. P.; L. T. Donovan, assistant to executive vice-chairman, Mechanical Division, A. A. R.

The report was accepted.

* * *



The new Diesel inspection and repair track of the Union Railroad at Hall, Pa.—Major repairs of the company's Diesel locomotives are handled at a heavy repair shop located at the same point

Coordinated Mechanical Programs

Meetings of the five mechanical associations and the A.A.R. Electrical Sections will be held at Hotel Sherman, Chicago, September 18 to 20

THIS year the meetings of the Coordinated Mechanical Associations—Air Brake, Master Boiler Makers', Car Department Officers', Fuel and Traveling Engineers, Locomotive Maintenance Officers—as well as the sessions of the Electrical Sections, A. A. R. Mechanical and Engineering Divisions, will be held at the Hotel Sherman, Chicago, for three days beginning Monday, September 18, through Wednesday, September 20. The programs of the five mechanical associations appear on this and the following two pages, and the program of the electrical groups appears on page 448. There will be an exhibit of electrical products by the Railway Electric Supply Manufacturer's Association. The individual associations will forego regular sessions Tuesday afternoon, September 19, so that their members might visit this exhibit.

The officers elected by the coordinating committee of the Coordinated Mechanical Associations, which is made up of the presidents and secretaries of the railway associations and the exhibiting organization, to serve through this year were: Chairman, A. K. Galloway, general superintendent motive power and equipment, B. & O.; vice-chairman, J. P. Morris, general manager, mechanical department, A.T. & S.F.; vice-chairman, George Bohannon, chief mechanical officer, C. & N.W.; secretary, C. F. Weil, American Brake Shoe Co. B. S. Johnson of W. H. Miner, Inc., is president of the Allied Railway Supply Association. C. G. Callow of the Waukesha Motor Company is president of the Railway Electric Supply Manufacturers' Association which has charge of this year's exhibit.

Locomotive Maintenance Officers' Association

MONDAY, SEPTEMBER 18

10 A. M.

Address by President G. E. Bennett, superintendent motive power, Chicago & Eastern Illinois

Address—Recommended Tonnage Ratings and Their Relation to Diesel Maintenance, J. Z. Heskett, special engineer, Baltimore & Ohio

2 P. M.

Report of Committee on Diesels—General, T. T. Blickle (general chairman), mechanical assistant, Atchison, Topeka & Santa Fe

Report of Committee on Diesels—Mechanical; L. L. Luthey (Chairman), Supervisor, Diesel engines, Atchison, Topeka & Santa Fe supervisor of Diesel Engines, Atchison, Topeka & Santa Fe. Topics:

(a) Program vs. Term Maintenance—Diesel Locomotives—Cost Accounting
(b) Air and Oil-Filter Maintenance
(c) Steam Generator Maintenance

TUESDAY, SEPTEMBER 19

9 A. M.

Report of Committee on Personnel Training, L. J. Brasher (chairman), assistant master mechanic, Belt Railway of Chicago. Topic: Technical Training of Diesel Supervisors

Report of Committee on Shop Tools, C. N. Rector (chairman), production engineer, Chicago & North Western

(a) Tools and Methods for Diesel and Steam Locomotive
(b) Wheel and Tire Turning
(c) Carbide Tools

WEDNESDAY, SEPTEMBER 20

9 A. M.

Report of Committee on Terminal Facilities—General, J. T. Daley (general chairman), superintendent motive power, Alton & Southern

Report of Committee on Terminal Facilities—Diesel, H. E. Niksch (chairman), master mechanic, Elgin, Joliet & Eastern

(a) Facilities for Diesel Locomotives at Outlying Points
(b) Types of Ventilation in Diesel Shops

Address by E. H. Davidson, director, Bureau Locomotive Inspection, I.C.C.

Report of Committee on Terminal Facilities—Steam, C. E. Pond (chairman), assistant to superintendent motive power, Norfolk & Western. Topic: Improving Steam Locomotive Performance Through Laboratory Standing and Road Tests

Report of Committee on Shop Practices—Diesel and Steam, F. B. Rykoskey (chairman), supervisor of shops, Baltimore & Ohio

(a) Roller bearing maintenance
(b) Cleaning and painting Diesel Locomotives
(c) Diesel parts repair

2 p.m.

Joint Session with Electrical Section, Mechanical Division, A.A.R.

Report of Committee on Automotive and Electric Rolling Stock, Electrical Section—L. S. Billau (chairman), electrical engineer, Baltimore & Ohio

Diesel-Electric report—W. P. Miller, superintendent of Diesel and motor-car equipment, Chicago & North Western

(a) Traction-Motor Armature Bearings
(b) Main Generator and Traction-Motor Flash-Over and Prevention
(c) Grease vs. Oil Lubrication in Anti-Friction Bearings
(d) Dust Proofing Electrical Control Equipment

Air Brake Association

MONDAY, SEPTEMBER 18

10 a.m.

President's address

Approved Maintenance Committee, F. W. Dell (chairman), Grand Trunk Western

2 p.m.

Broken Pipes—Diesel Locomotive Air Brake Equipment, Central Air Brake Club, R. W. Daniel (chairman), supervisor air brakes, Chicago, Indianapolis & Louisville

Radiation—Diesel Locomotives, Manhattan Air Brake Club

TUESDAY, SEPTEMBER 19

9 a.m.

Brake Pipe Leakage—W. B. Weightman (chairman), general air brake inspector, Pennsylvania

Charging Long Freight Trains and Facilities Therefore, R. J. Densberry (chairman), Chesapeake & Ohio

ABLC-Brake Equipment, G. L. Cotter, Westinghouse Air Brake Company

WEDNESDAY, SEPTEMBER 20

9 a.m.

Maintenance—Budd Disc Brakes, H. I. Tramblie (chairman), air brake engineer, Chicago, Burlington & Quincy

Good Brake System Maintenance Improves Freight Train Handling, Pittsburgh Air Brake Club

Characteristics of Air Flow in Automatic Train Braking, W. F. Klein, New York Air Brake Co.

2 p.m.

Troubles and Remedies—24-RL Brake Equipment, St. Louis Brake Club

Business Session

Railway Fuel and Traveling Engineers' Association

MONDAY, SEPTEMBER 18

10 a.m.

Address by D. S. Ellis, president, Lima-Hamilton Corporation

Gas-Turbine Electric Locomotive, by R. A. Williamson, manager railroad rolling stock division, Locomotive and Car Equipment Department, General Electric Company

Operation of Electro-Motive Diesel Locomotives, by W. H. Fortney, chief road foreman of engines, Cleveland, Cincinnati, Chicago & St. Louis

Rating and Starting Tonnage of Diesel Locomotives, J. Z. Heskett, special engineer, Baltimore & Ohio

2:30 p.m.

On-the-Road Trouble Shooting, wtih slides, by D. Martin, Electro-Motive Division, General Motors Corporation. To be followed by a question period.

TUESDAY, SEPTEMBER 19

9 a.m.

Address by J. Hyslop, Hanna Coal Company

Progress on the Use of Prepared Coal and Handling Coal in Freezing Weather, by E. Benton, Ohio Coal Association

Oil for Steam Locomotives, by G. E. Anderson, general fuel supervisor, Great Northern

Education of Steam Engine Crews, by A. H. Glass, chief power and fuel supervisor, Chesapeake & Ohio

Effectiveness of Co-ordination of Railroad and Smoke Inspectors in Control of Railroad Smoke, by H. C. Ballman, smoke regulation engineer, Columbus, Ohio

WEDNESDAY, SEPTEMBER 20

9 a.m.

Passenger-Train Handling, by F. T. McClure, supervisor air brakes, Atchison, Topeka & Santa Fe

Freight-Train Handling and Dynamic Braking, by R. H. Francis,

general road foreman of equipment, St. Louis-San Francisco
Operation and Trouble Shooting (Alco-G.E.), with slides, by S. E. Lodge, American Locomotive Company. To be followed by a question period
Operation of Yard Diesels, by M. G. Stewart, Washington Terminal Company
Election of officers

2 p.m.

Alco-G.E. Electrical Equipment, by H. R. Hill, General Electric Company. To be followed by a question period
Abuse of the Diesel Locomotive, by R. H. Francis, general road foreman equipment, St. Louis-San Francisco
Operation of Vapor Steam Generator, with slides, by G. C. Scott, service manager, Vapor Heating Corporation

Car Department Officers' Association

MONDAY, SEPTEMBER 19

10 a.m.

Address by President G. H. Wells, assistant to superintendent, car department, Northern Pacific
Address by W. W. Judson, vice-president (operating), Northern Pacific
Report of Committee on Air-Conditioning Equipment—Operation and Maintenance, C. S. Albright (chairman), supervisor electrical equipment, New York Central

2 p.m.

Report of Committee on Wheel-Shop Practices, R. L. Frame (chairman), wheel-shop foreman, New York Central
Report on Car Lubrication, G. R. Andersen (chairman), superintendent car department, Chicago & North Western

TUESDAY, SEPTEMBER 20

9 a.m.

Report of Committee on Interchange and Billing for Car Repairs, R. W. Hollon (chairman), mechanical inspector, Chicago, Burlington & Quincy
Address by D. P. Loomis, chairman, Association of Western Railways
Report of Committee on A.A.R. Loading rules, J. Krupka (chairman), general car foreman, Chicago, Burlington & Quincy

WEDNESDAY, SEPTEMBER 21

9 a.m.

Report of Committee on Responsibilities of Car Department Supervision—Qualifications and Selection of Car Department

Supervision, R. E. Baker (chairman), assistant general manager (mechanical), Boston & Maine
Report of Committee on Modern Methods of Painting, R. Middleton, painter foreman, New York, Chicago & St. Louis

2 p.m.

Report of Committee on Analysis of Train Yard Operations to Improve Performance—Education of Car Inspectors, G. J. Flanagan (chairman), general car inspector, New York Central System
Miscellaneous Reports
Election of officers

Master Boiler Makers' Association

MONDAY, SEPTEMBER 18

9:30 a.m.

Message, President E. H. Gilley, general boiler foreman, Grand Trunk Western
Address by W. C. Bowra, general superintendent motive power and car equipment, Grand Trunk Western
Report of the Committee on Law, C. L. Combes (chairman), associate editor, Railway Mechanical and Electrical Engineer
Report—Topic No. 5: Advantages of Steam Space Spray Boiler Checks, or Top Checks vs. Side Boiler checks, F. E. Godwin (chairman), mechanical inspector, Canadian National

2 p.m.

Report of the Executive Board
Address, A. F. Stiglmeier, Secretary-Treasurer, general supervisor boilers and welding, New York Central System
Message, C. E. Bell, superintendent of safety, Reading
Report—Topic No. 2: Proper Brick Setting in Locomotive Fireboxes for Oil- and Coal-Burning Locomotives, H. R. Barclay (chairman), general boiler inspector, Northern Pacific
Report on Steam Heat in Passenger Cars, by K. D. Relyea, test department, New York Central System

TUESDAY, SEPTEMBER 19

9:15 a.m.

Address by Edward H. Davidson, director, Bureau of Locomotive Inspection, Interstate Commerce Commission
Election of officers
Report—Topic No. 1: Treating of Feedwater for Locomotive Steam-Hot Boilers, T. W. Hislop (chairman), water-service engineer, New York Central System

WEDNESDAY, SEPTEMBER 20

9 a.m.

Report—Topic No. 3: Advantages of Special Coating Boilers and Tenders: Flues and Tubes, E. H. Heidel (chairman), general boiler inspector, Chicago, Milwaukee, St. Paul & Pacific
Report—Topic No. 4: Conditioning of Boiler and Firebox Sheets after Classified Repairs; Preparing Locomotive for Storage and Removal from Storage, R. W. Barrett (chairman), chief boiler inspector, Canadian National

2 p.m.

Report—Topic No. 6: Procedure for Welding Staybolts, Floyd R. Seeley (chairman), general boiler inspector, Union Pacific

ELECTRICAL SECTION

Two Electrical Sections Join Forces

To more effectively coordinate the railroads' rapidly increasing use of electrical equipment, Electrical Sections of the Engineering and Mechanical Divisions, A.A.R., will meet as one body and will also hold a joint session with the Locomotive Maintenance Officers' Association

Railway Electric Supply Manufacturers Association will hold exhibits at the Hotel Sherman, Chicago

Joint Sessions Electrical Sections
Engineering and Mechanical Divisions
Association of American Railroads

September 18 - 20

MONDAY, SEPTEMBER 18

10:00 a.m.—Joint meeting of the Coordinated Associations, Grand Ballroom, Mezzanine Floor, Hotel Sherman.
Address—Speaker and subject to be announced.

10:30 a.m.—Joint Meeting of the Electrical Sections, Engineering and Mechanical Divisions.
Address by S. R. Negley, (*chairman*, Electrical Section, Engineering Division), electrical engineer, Reading.
Address by W. S. H. Hamilton, (*chairman*, Electrical Section, Mechanical Division), electrical engineer, New York Central.
Unfinished business, Electrical Section, Mechanical Division.
New business, Electrical Section, Mechanical Division.
Election of officers, Electrical Section, Mechanical Division.
Report of Joint Committee on Wire, Cable and Insulating Materials.
Report of Joint Committee on Power Supply.

2:00 p.m.—The Committees which will present reports are as follows:
2—Electrolysis—Engineering Division.
3—Overhead Transmission Line and Catenary Construction—Engineering Division.
9—Track and Third Rail Bonds—Engineering Division.
10—Illumination—Engineering Division.
Application of Radio and Communicating System to Rolling Stock—Mechanical Division.
Motors and Controls.

Adjournment—Visit to Exhibit of the Railway Electric Supply Manufacturers Association.

TUESDAY, SEPTEMBER 19

9:00 a.m.—Unfinished business, Electrical Section, Engineering Division.
New business, Electrical Section, Engineering Division.
Report of Committee 11—Electric Heating—Engineering Division.
Report of Joint Committee on Welding and Cutting.
Report of Committee on Car Electrical Equipment—Mechanical Division.

Afternoon—Visit to Exhibit of the Railway Electric Supply Manufacturers Association.

WEDNESDAY, SEPTEMBER 20

9:00 a.m.—Report of Committee on Car Air Conditioning Equipment—Mechanical Division.

2:00 p.m.—Joint Session with Locomotive Maintenance Officers' Association.
Report of Committee on Automotive and Electric Rolling Stock—Mechanical Division.
Diesel-Electric Report—
Traction-Motor Armature Bearings.
Main Generator and Traction-Motor Flash-Over and Prevention Grease vs. Oil Lubrication in Anti-Friction Bearings.
Dust-Proofing Electrical Control Equipment.

Eliminating Loose Field Coil Connections

Fig. 1—Coil leads in various stages of preparation for brazing—At the right is a copper sleeve—Next is a piece of cable to which the lead has been applied—Third from the right is a lead after pressing in the die at the right—Fourth is a lead beveled to the right angle—At the left is a lead with a brush holder connection and the die for its application

The Rock Island has developed a method of brazing stranded field coil leads which eliminates loose terminals and open field coils

Fig. 2—Leads in fixture and protected with abestos, being brazed.

By C. F. Steinbrink

Loose field coil connections have been the cause of many traction motor failures and as many different methods of testing have been devised as there are railroad shops. Every shop has its own pet method of testing and none of them has proven 100 per cent satisfactory. Realizing, several years ago, that some other method or material would have to be used to replace the solder used to apply the connector between, as well as on the field coil itself, we tried many different so-called high temperature solders, but the vibration caused these solders to loosen in the terminal lug, and they had to be discarded as unsatisfactory.

These loose connections have been the cause of a large number of armature failures, and they are usually not detected until the field coil circuit has burned open. A check of armature failures will show that two or three armatures have failed in the same frame and, in all cases, with short mileage. In almost 100 per cent of the cases, the cause will be a partially open field circuit.

One manufacturer tried to correct this trouble by using a copper bus for wiring around the motor

* General Electrical Foreman, Chicago, Rock Island & Pacific.

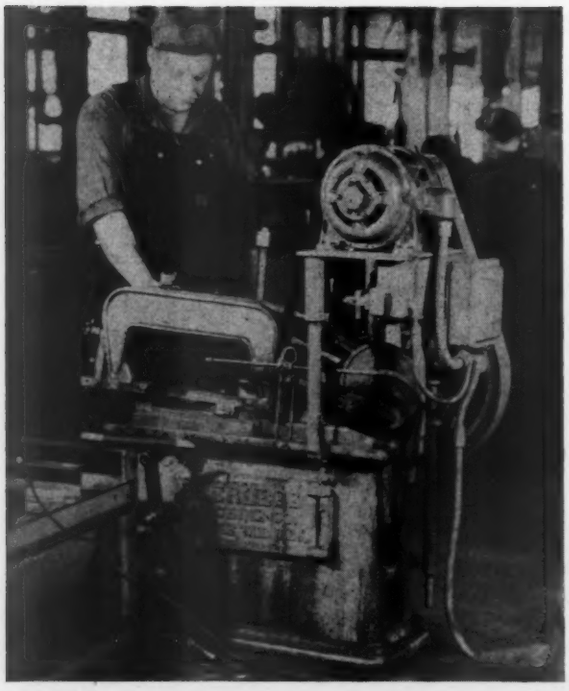


Fig. 3—The leads are beveled with a hacksaw so they will project from the coil at the correct angle

frame, but the copper soon crystallized, and broke after about two years' operation. On the next production of these motors, a flexible connection was applied at the field coil terminal. This did not prove satisfactory as the flexible connector would break due to the fact that all the vibration was concentrated at one point. Later on this same manufacturer used two copper straps in parallel and still it was not satisfactory, as the breaking of one strap caused an armature winding failure. In all these different methods, bolts were used to fasten the bus to the field coil or fasten the ends of the bus together. This was not satisfactory, because, regardless of what was used to keep the bolts tight, whether spring lock washers, torque wrenches to set the bolts with just the right torque, special material bolts, etc., we still

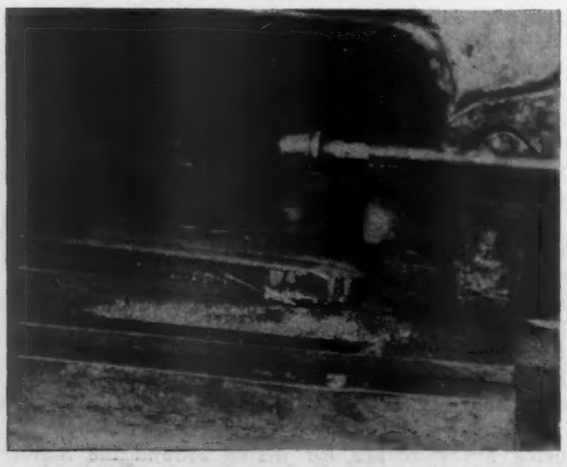


Fig. 4—Close-up of the beveling operation

continued to have loose connections and burned out armature windings.

We tried to get the traction motor manufacturers interested enough in these failures to work out some satisfactory means of correcting these numerous failures, or at least some way of detecting the cause of the failure before it actually caused an armature failure. But, although we did get many words and many instructions, we never did get any satisfactory test or any suggestions for correcting or eliminating these failures. The older the motor was, or the more miles it had accumulated, the more failures we had.

We next tried to interest the solderless lug manufacturers in making a large compression fitting that would eliminate the soldered lug or terminal, but as none of these manufacturers could see any volume

Fig. 5—Finished set of coils with leads applied

of business, we could not get them interested, as the cost of dies and punches would not make it profitable.

After trying many ideas, and several years of testing, we have decided to equip all motors regardless of type or manufacturer, with a high-pressure, silver-soldered type terminal as extra precaution.

Figure 1 shows the tools and necessary steps in making the terminal. A short section of round copper tubing is placed over the strands and pressed in the tool shown on the right behind the copper tubing. This tubing is pressed under 60 tons pressure, forming a square section as shown in the first short lead on the right. The second short lead is shown cut on the required angle to make the terminal butt after it is assembled in the frame. The brush holder connection and tools required to press this terminal on the lead is shown on the left. This terminal is also applied under 60-ton pressure. After these terminals are formed, the ends are silver soldered, using an oxy-acetylene torch. The copper strands are so closely pressed together under this pressure that looking at the end of the strands, it looks like a solid piece of copper. When pressed tightly in this manner, the stranded lead can easily be silver-soldered without burning the copper. The brush holder connection has been built up with brass so it can be machined to take a $\frac{5}{8}$-in. bolt, replacing the $\frac{3}{8}$-in. or $\frac{1}{2}$-in. stud. The brush holder itself is also machined to take the larger boss.

Figure 2 shows the fixture used to hold the leads at the correct angle on an interpole coil. Since all

the leads have to come off at a different angle, different fixtures are required for the different coils, both exciting and interpole. With the leads laid on this fixture, they are silver soldered to the coil proper, using a torch as shown. Before soldering, pieces of untreated asbestos are saturated in water and applied around the lead so that the heat generated by the torch will not burn the insulation off the lead. The insulation on the coil itself is previously removed.

Figure 3 shows the lead being beveled to the right angle in a power hack saw after application of the terminal but before being silver soldered. Figure 4 is a close up of the same operation.

Figure 5 shows a complete set of exciter and interpole coils completely retaped and ready for application to a motor frame.

Figure 6 shows the induction heater tongs used to heat the ends of the terminal where they are butted together ready for silver soldering. To more clearly show the application of these tongs, they were applied to the lead before the coils were applied in the motor.

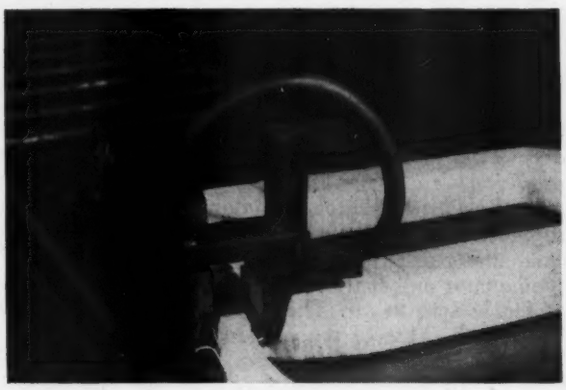


Fig. 6—Induction heater tongs used to heat ends of terminal for silver soldering

After making the necessary tools and fixtures, it will cost approximately $75 to make and apply these silver solder connections provided, of course, the coils require re-insulating. This application has entirely eliminated all loose and open field coils and terminals, and has gone a long way towards eliminating unknown reasons for a very large number of armature winding failures.

Ampere-Hour Meter on Crane Truck

By W. E. Abbott

An Elwell-Parker Electric crane truck at the North Bergen enginehouse of the New York Central is equipped with a 15-cell Exide Ironclad battery. Before the application of the ampere-hour meter, as shown in the picture, the battery was receiving too little or too much charge which resulted in the truck battery being dead when needed or the battery being damaged by over-charge.

The battery now in use was out for repairs about 26 months ago, and previous to that, it was in service 9 years and 4 months. The ampere-hour meter has been in use for the two periods and we believe that the long life of this battery is due to the use of the meter.

Under protection of the ampere-hour meter, the battery served the truck nine years and four months before overhaul and has been in service 26 months since then

The meter is connected in the power circuit between the battery and the charging plug receptacle. It has a red hand which is set at 305 amp.-hr., to correspond to the capacity of the battery. As a charge is applied to the battery, the pointer of the meter advances toward the red hand setting and as the truck is used and battery discharged, the meter pointer goes toward zero.

At any time, the meter can be checked to determine if the battery is in need of charge and when the red hand and pointer meet, the charge is completed. From time to time the pointer may be turned back toward zero for extra charge if the gravity reading shows the battery is a little low.

The meter makes it unnecessary to take gravity readings for battery protection except at the time of checking electrolyte level.

Commutator Soldering *By High Frequency Heating*

The method enables an operator to do high quality work in a very short time on any type or size of armature

*By Loren Jones**

THE difficulty of efficiently heating commutator risers on the larger types of armatures used in traction motors and generators to a temperature necessary for soldering or removing old coil leads has always presented a serious problem to manufacturers and service shops. The commutators on armatures of this class are large and massive; consequently, they require a considerable amount of heat to bring them up to soldering temperature.

In the majority of service shops the soldering operation is usually accomplished by a combination of an internal gas-heated soldering iron and a gas torch. The flame of the gas torch is used to pre-heat a general area while the iron supplies the necessary localized heat for soldering the coil leads in the risers. Not only is this method slow, but the gas flame causes excessive oxidation of the commutator copper, while the thoroughness of the soldering job depends upon the skill and the patience of the worker.

Coil leads may also be soldered in the riser slots by a method similar in principle to the so-called "heat dip solder method" applicable to small armatures. In this method, the commutator end of the armature is simply lowered into molten solder until the commutator is almost completely immersed. The molten solder is then allowed to heat the commutator until the riser or slots take solder, after which the armature is withdrawn.

To apply this principle of soldering to large commutators, it is apparent that it would be undesirable to expose the whole commutator to molten solder; instead, provisions are made in the equipment to confine the molten solder to the commutator neck. This is done by supporting the armature vertically at the base of the commutator neck in a machine fitting ring or gasket. The commutator and shaft then project down into a well open at the bottom to air. The gasket insures a sealed joint between the base of the commutator neck and the well. The level of molten solder surrounding the well is then raised until the commutator neck is just immersed. The molten solder then must heat the risers until the riser slots take solder, after which the level of the molten solder is lowered and the armature removed. The level

*Engineer, National Electric Coil Company, Columbus, Ohio.

Hand soldering leads in the risers of a traction motor — A gas torch is used to preheat a general area, while an internal gas soldering iron supplies the necessary localized heat to bring the individual risers up to soldering temperature

High frequency induction heating provides a way of quickly heating the risers to soldering temperature, for knocking out the coil leads remaining in the risers after the armature has been stripped of its old winding—After the leads are knocked out, a jet of air is used to clean the slots, which leaves a nicely tinned riser requiring no further attention

of the molten solder is controlled by varying the displacement of a large sphere or cylinder in the molten solder. The temperature of the solder is maintained at approximately 700 deg. F. (371 deg. C.) by automatically controlled electric heating elements. While this method performs the actual soldering in some odd 4 to 6 minutes, the armature must first be preheated from 8 to 10 hours at 275 deg. F. (135 deg. C.).

A search for an efficient, quick, dependable method of heating the commutator neck to soldering temperature led to the application of high frequency induction heating, which has proven practical and economical. The simplicity of operation, coupled with the rapidity of uniformly heating the risers, results in advantages which are difficult to ignore. Soldering coil leads in the risers reduces the operation to practically a mechanical function of the equipment, which insures uniformity and thoroughness. Equally impressive is the induction heating of the risers for knocking out leads of armatures stripped of the old winding; not only is the operation amazingly quick, but by using a jet of air the remaining solder in the riser slot can be blown out, leaving conveniently a nicely tinned slot that requires no further attention.

The principle of induction heating involves the transfer of energy from the work coil to the material by virtue of the electro-magnetic field associated with the heavy high frequency circulating current in the work coil. For the non-magnetic metals the phenomenon can be considered as that of the transformer, the work coil being the primary while the material corresponds to a short-circuited secondary. The thermal power is generated by the I^2R loss in the metal.

Because it is necessary to use a rather high frequency current to secure an efficient concentrated energy transfer from the work coil to the material, the associating skin effect of high frequency current is present. This phenomenon causes the induced current to circulate near the surface of the metal risers which are encompassed by the work coil. This condition, however, is partially neutralized by the resistance of the outer surface of the material, which increases with temperature, causing the current plane to be forced into sub-surface layers. This characteristic, plus the high heat conductivity of copper, results in no surface overheating until the entire cross-

(Continued on page 460)

Progressively soldering the coil leads in the risers of a large traction motor armature by high frequency induction heating—The risers are rapidly and uniformly heated to soldering temperature as they pass through the work coil — Ordinary hard-wire solder is used to touch up the soldering of individual risers

Locomotive Wheel-Slip And Wheel Lock Protection*

A summary of the various methods which are available for effecting both partial and complete wheel slip detection and protection

By R. M. Smith †

THE reasons for having a complete wheel-slip detection system are: (1) To prevent excessive traction-motor and locomotive speeds; (2) To allow the operator to detect slip on trailing units which are out of normal hearing distance; (3) To obtain optimum locomotive performance, i. e., tractive force, at all speeds; (4) To prevent derailment due to locked axles; (5) To prevent false forward transition, and (6) To prevent wheel slide during braking.

It is commonly assumed that a locomotive driving wheel in motion, but not slipping, has a static friction lock with the rail and that when this friction lock is broken, the factor of adhesion drops very rapidly as slip increases. That this is not altogether an accurate picture can be seen from the curve of adhesion versus rate of slip, Fig. 1. If the curve of adhesion values is continued back to zero slip, a value of about 22 per cent is obtained. It is well known that in starting, values of 25 per cent with dry rail are normally obtained and values up to 40 per cent can be reached under special conditions. Why, then, must the high-speed rolling friction given by this curve be less? This is due to the fact that a rolling wheel always has a small amount of slip associated with it.

Consider for a moment a wheel as shown in Fig. 2. As torque is applied about the center (O), the sections *AB*, *BC* and *CD* are under compression whereas sections *DE*, *EF*, and *FG* are under tension. A sketch of the area of contact, shown in Fig. 3, reveals that the front section of the area is under compression whereas the rear section is actually under tension. The fact that part of the wheel tread is under compression requires that the wheel make more revolutions per mile than would be indicated by simply considering the distance moved per revolution as the circumference of the wheel. This factor may be calculated as follows:

$$\text{Forces at point of contact} = \frac{\text{Coefficient x velocity of creep}}{\text{Velocity of roll}}$$

If a steel wheel is considered, a representative value of the coefficient equals:

$$\frac{3{,}500}{\sqrt{\text{Diameter of wheel (in.) x Weight on axles (lb.)}}}$$

For the purpose of illustration, assume a 50-in. wheel and 50,000-lb. axle loading. If the rail and wheel were in a static lock, which we are attempting to show is not true, we would expect to develop 12,500 lb. tractive force. The coefficient now equals 5,530,000 and the velocity of creep equals .227 per cent. Thus, the locomotive in moving one mile actually causes its wheel to rotate 1.00227 miles.

A second factor, indicating that the rolling condition is actually one of small slip, is the taper applied to the wheel tread. Curves or irregularities in the track cause the wheels to move laterally on the rails from one side to the other. If the flange on one wheel is against the rail, then the opposite wheel must be running on a circle of smaller diameter, hence one of the wheels must slip as the axle moves to center itself. Note that the degree of this inherent slip is dependent on speed and that at lower speeds higher factors of adhesion are more common.

The tractive force characteristics of a Diesel-electric locomotive are shown in Fig. 4. This curve cannot be expected to match the change in the factor of adhesion shown in Fig. 1. If a wheel can be accelerated enough to move onto the sharply decreasing portion of the factor of adhesion curve, and no change in friction characteristics takes place, the wheel will accelerate until a new balance between the torque characteristics of the motor and the friction characteristics of the wheel takes place. This represents an idealized case and will occur only in unusual circumstances when track conditions and axle loadings remain constant. That this is possible, however, is shown by Fig. 5, taken from track tests or a gas-turbine electric locomotive in which the axle accelerated and then

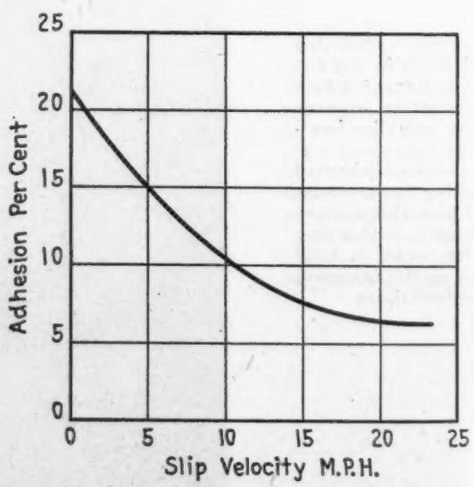


Fig. 1—Adhesion versus slip velocity

*Abstract of a paper presented at the Summer and Pacific General Meeting of the American Institute of Electrical Engineers held in Pasadena, Calif., June 12-16, 1950.

†Control Engineering Division, General Electric Company, Erie, Pa.

stabilized itself at a speed approximately 13-m.p.h. greater than the running speed. A more common type of slip is for the wheel to vary widely in speed as the action of the truck equalizers alters axle loadings.

Additional Factors Causing Slip

At high speeds, there are several factors which, singly or in combination, can cause the weight on the driving axle to be reduced momentarily. These same factors are present on steam and electric locomotives, but because of the greater inertia involved, the slip does not have time enough to reach a value at which the factor of adhesion is seriously reduced. Among the factors which can cause a temporary reduction in the weight on a driving axle are: (1) unbalance in the driving wheel itself; (2) eccentricity of the driving wheel; (3) irregularities in the track, particularly switch frogs and crossings; (4) journal boxes cramped in their guides; (5) poor operation of the equalizers; (6) high gradient equalizer springs; (7) weight shift; and (8) any vertical oscillation caused by resonance in the spring system. It is very difficult to assess these factors quantitatively. For example, measured accelerations of 5 g to 13 g have been obtained on the ends of axles moving through crossings at high speed. The duration of these accelerations is short, however, and by themselves they do not normally cause wheel slip. It is probable that a combination of the above factors is necessary to cause high-speed wheel slip.

The other cause of high-speed wheel slip is momentary reduction of the factor of adhesion with constant axle loading. This may occur from changes in rail surface conditions caused by: (1) mist or dew; (2) mill scale occurring on newly laid rail, and (3) oil, fertilizer, insects, wet leaves and other foreign substances on the rail.

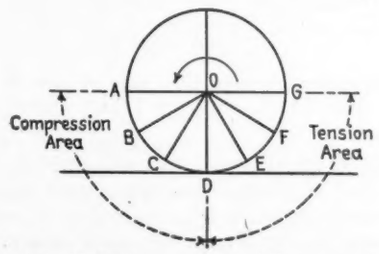


Fig. 2—Driven wheel rolling on rail

Low-Speed Slip

Low-speed slip can be started by either of the basic methods outlined above; that is, by temporarily unloading an axle, or by decreasing the coefficient of adhesion. Dynamic factors such as wheel unbalance are insignificant.

The general subject of low-speed wheel slip, particularly the causes of low adhesion, has been reported at length in other publications and will not be discussed here.

Detection of Wheel Slip

At present, there are available a number of schemes for detecting locomotive wheel slip. These are: (1) The detection of electrical unbalance between traction motors; (2) The measurement of residual motor voltage; (3) The frequency-sensitive system; (4) Various acceleration schemes; (5) The axle-mounted commutator and brush system; (6) Individual axle generators; and (7) The axle-mounted centrifugal switches.

Differential Voltage Detection

The one in most common use employs a relay connected as shown in Fig. 8A. This relay measures the unbalance in current which exists between traction motors during slip conditions. If one motor should speed up, its current drops, thereby unbalancing the bridge circuit and actuating the relay.

This system has the advantage of low cost, and of the fact that, since it measures electrical quantities, it is easily connected in the cab. It detects wheel slip, and a locked axle only when power is on. It does not detect overspeed, nor does it furnish locked-axle protection when the motor is disconnected.

Fig. 8B shows the same type relay connected so as to measure differential armature voltage.

In both of these circuits the relay is subject to transient voltages due to current surges in the motors. These in turn are caused by changes in track surface causing relative movement between field and armature, commutation phenomena, etc.

In order to care for transient voltages and normal

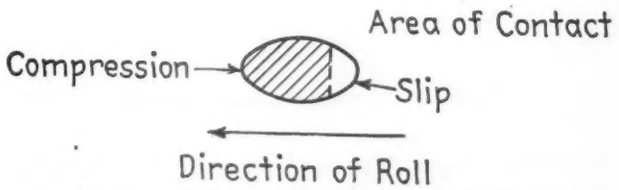


Fig. 3—Area of contact between driven wheel and rail

electrical differences in motors, it is necessary to make these relays comparatively insensitive. In the high-speed connection with shunted motor fields, relatively large speed differentials are required to operate the relay. The possibility of stabilized slips of 10 to 20 m.p.h. over locomtoive speed plus the high differential required in the high-speed region make this system only partially effective. Moreover, it gives wheel-slip indication of varying sensitivity during acceleration and locked-axle protection only with power on.

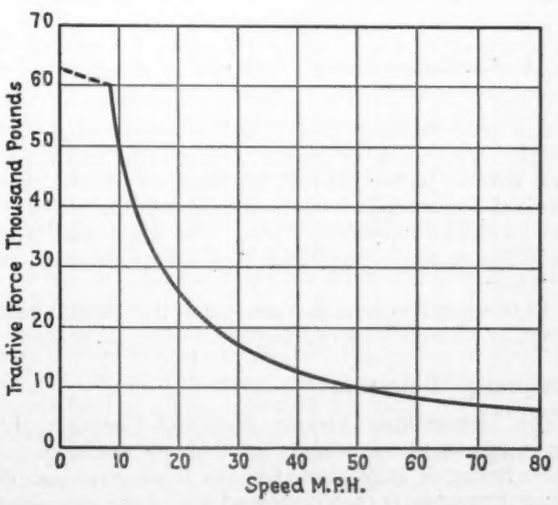


Fig. 4—Speed-tractive force curve, 1,500-hp. Diesel-electric freight locomotive

Residual Motor Voltage Measurement

In conjunction with the system just described, there is a method of furnishing locked-armature protection by measuring residual motor voltage. A relay is connected across each traction motor armature. As long as residual voltage exists the relay is picked up. If, as in the case of a locked armature, no residual exists, this relay drops out.

One type of G-E traction motor widely used on Diesel-electric locomotives has a maximum residual voltage of 21.9 volts at 2280 r.p.m. At 5 per cent speed, the lowest residual voltage is .5 volt. Thus, the relay measuring the residual must be able to operate on 2.05 per cent of the maximum voltage applied across it.

Actually, if power is taken off while moving, energy to pick up the relays comes partly from the inductive energy stored in the motor fields. If a locomotive should

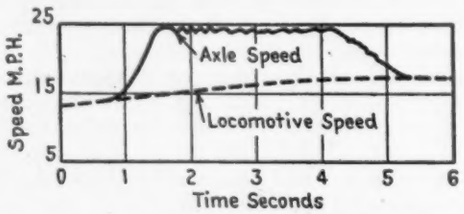


Fig. 5—Oscillogram showing stable slip

start with a locked axle, the protective relays could not be expected to pick up until a much higher speed was reached than that at which drop-out occurs. These relays provide locked-axle protection with power off. Occasional malfunctioning due to variations in residual voltage can be expected.

It would be possible to add a third set of relays to check on motor overspeed. Still others might possibly be included to cover rolling slip during braking (either air

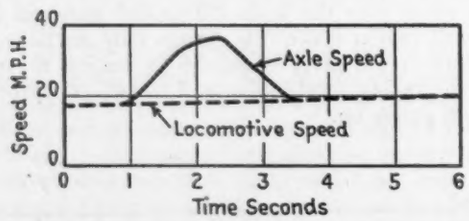


Fig. 6—Oscillogram showing rapid rate of rise of wheel slip

brakes or dynamic brakes). Such a system would offer complete protection by means of apparatus and connections entirely within the cab. The number of components required for complete wheel-slip, wheel-slide, overspeed and locked-axle protection woul dbe great and would probably result in unreliable operation under certain conditions.

An integrated system, independent of the traction motor power, is inherently more reliable for complete protection.

Frequency Detection

The Metropolitan Vickers Electrical Company, Ltd. has in operation one scheme in which an auxiliary pole-face winding is incorporated in the traction motor. The output frequency is then compared with frequency signals from the other traction motors.

This approach could be made to give complete protection. The high premium put on winding space within the traction motor, however, makes it unlikel ythat this scheme will be widely adopted in this country.

Acceleration Measurement

Various acceleration measuring methods have been suggested. At least two such devices are in fairly common use on passenger cars to prevent slid flats during braking. Deceleration rates in this service are in the order of 25 m.p.h.p.s. during wheel sliding. By contrast, rates of acceleration during locomotive wheel slip may range from 3 m.p.h.p.s. to 20 m.p.h.p.s. as shown in Figs. 6 and 7. Accelerations in the lower ranges would cause unreliable operation of such devices. In addition, starting a train with a locked wheel would obviously give no indication of acceleration. It is apparent, therefore, that a measurement of velocity is necessary.

Speed Differential Measurement

One device which could be adapted to measuring locomotive wheel slip consists of a fixed commutator and a rotating brush mounted on the journal box and driven by the axle. This device measures the difference in rotative speed between any two axles. It depends upon the improbability of any two axles slipping or sliding at the same rates. If the two axles being compared have their driving motors connected in series, this is very likely true. If two traction motors are connected in series across a fixed

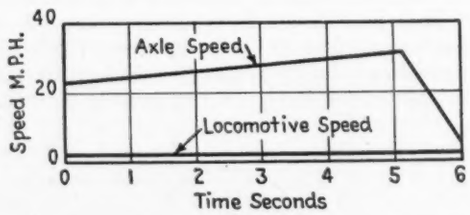


Fig. 7—Oscillogram showing slow rate of rise of wheel slip

voltage, a speed-up of one motor will cause it to develop more than half the supply voltage across its terminals. This will be accompanied by a reduction in voltage and torque (shown in Fig. 9) on the other motor. Although this voltage shift does not limit acceleration on the slipping axle, it does insure that under ordinary rail conditions the second axle will not slip.

The cost of this system is high compared to the differential relay protection commonly employed. It is also probable that there will be an appreciable maintenance problem on the commutator and brush rigging.

Variations of this system would allow complete protection.

Locked-Axle Protection

There has very recently come onto the market another system known as the King wheel slide indicator which gives protection only against locked axles. This consists of axle-mounted centrifugal switches. As the locomotive reaches a predetermined speed, one of the axle switches (designated as the master switch) closes and applies power to similar switches mounted on all the other axles. If each of the other axle switches has tripped, indicating that all axles are turning, a light relays this information to the engineer. This device furnishes only locked-axle protection and must be coordinated with one of the other

systems described in order to give complete wheel-slip protection.

Individual Axle-Generator Protection Scheme

The Alco-GE gas-turbine electric locomotive was built to study the application of a gas turbine to locomotive service. One of the factors under observation was the wheel slip characteristics of the unusual axle arrangement. The system installed consisted of individual axle-mounted generators, of the same type as those used for controlling transition on Alco-GE locomotives, with a relay to detect the difference in voltage between each generator and the average for all eight generators. Specifications were that the system should operate on a speed differential of 5 m.p.h. This was to allow for normal differences in wheel diameter. Since the generators are of the permanent-magnet type, the system is independent of any locomotive power supply. It is possible to protect against motor overspeed by measuring the absolute value of generator voltage. This system answered the requirement of furnishing complete protection, but the cost of the axle generators makes its widespread use doubtful.

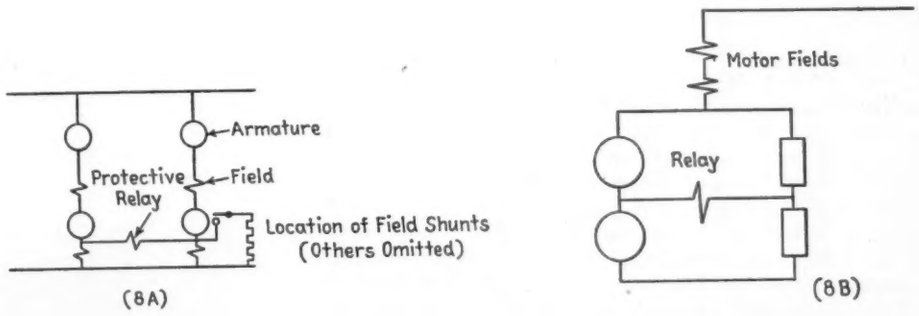


Fig. 8A—(left) Wheel slip protection circuit connected to measure unbalance in traction motor current—Fig. 8B—(right) Connected to measure differential armature voltage

Requirements for Complete Protection

A study of the oscillograms of actual slips obtained on the Alco-GE gas-turbine electric locomotive and also Diesel-electric switchers and road locomotives allows a consideration of the deficiencies existing in the present methods of wheel-slip detection and makes it possible to draw up a tentative set of specifications for a complete wheel-slip protection system. The system should furnish four types of protection: (1) Wheel-slip protection during acceleration; (2) Wheel-slip protection during braking (air or dynamic); (3) Locked-wheel protection; and (4) Overspeed protection.

At low speeds, the protective devices should operate at speed differentials of about 5 m.p.h. At speeds of 40 m.p.h. or greater, the allowable slip should be increased to permit a slip equal to 10 to 15 per cent of locomotive speed. The reason for this tapering of sensitivity at higher speeds is to allow self-recovery due to changes in rail condition. It has already been pointed out that starting of high-speed slip is usually a transient phenomenon. Therefore, if normal rail conditions are restored, wheel slip will often stop without requiring corrective action, with its attendant loss in tractive force. In any case, if the rate of rise should exceed 10 m.p.h.p.s., corrective action would be taken regardless of the actual speeds involved. A study of the various oscillograms taken reveals no case of recoverable slip occurring at acceleration rates greater than this.

Before locked-axle protection can function, the locomotive must attain some finite speed sufficient to determine that an axle is actually locked. A fair compromise for this figure seems to be 5 m.p.h.

During dynamic braking, it is desirable to be able to load each wheel up to the maximum available factor of adhesion. If the traction motors are properly connected, it is not possible to lock wheels during dynamic braking because at zero speed, the power output of the motor is zero. The fact that there is little likelihood of damaging the traction motor or the wheels during small values of slide in dynamic braking, coupled with the desire to get maximum braking force from the locomotive should allow higher values of permissible slide to be established. A value may be tentatively set at 20 per cent of the locomotive speed or 10 m.p.h., whichever is higher.

The overspeed feature of the system should be set at whatever value the manufacturer recommends for the motor with which the locomotive is equipped.

The correction initiated by such a wheel-slip scheme should be automatic and should be limited to the unit affected. In any practical control scheme requiring action by the engineer, he can only correct slipping on any one unit by reducing the power on all. The resultant loss in tractive force is undesirable. In overspeed, the time lag occurring between the signal to the engineer and the actual reduction in power could be great enough to allow permanent damage to the motor, hence the requirement for automatic correction. A cab indication of slip is necessary to warn the engineer of repeated slips so that he can reduce power. Locked-axle protection definitely requires a cab indication.

Two approaches to this problem exist. One is to add more devices to the schemes already used to provide partial protection. The other is to develop one integrated system for the whole protective function.

Modifications to existing systems have been made by several railroads, and these are now undergoing tests. The idea of a single protective system has been tried on a much smaller scale. Only further experience in actual service can prove the superiority of either of these two approaches.

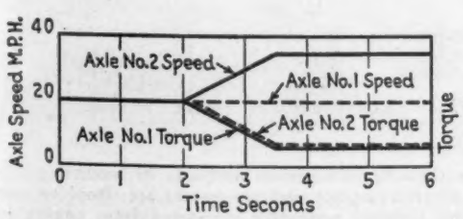


Fig. 9—Torque loss on series-connected motors

Performance of Diesel Locomotive Generators

A summary of what should be expected of a machine which must function both as variable-voltage generator and starting motor

Part II

*By C. A. Atwell**

Good mechanical performance of Diesel-electric locomotive generators is as necessary as good electrical performance. It is fundamental that these generators have rigid frame construction and solid mounting with respect to the engines that drive them. Present-day frames are made from steel plate rolled into cylindrical shape. It usually works out that the thickness and length of the cylindrical barrel required for magnetic reasons is enough to give the frame plenty of mechanical rigidity.

The commonly accepted method of supporting the generator armature is to use a single ball or roller bearing at the outboard end, and to support the engine from the engine crankshaft flange.

There are three common successful ways of mounting a single-bearing generator and of making the coupling between it and the engine;—

(a) Generator and engine mounted on a common bedplate

(b) Generator completely overhung from engine

(c) Generator and engine assembled into a unit and this assembly supported at three points, one at each side of the generator and one at the far end of the engine.

These three methods of mounting are shown in Fig. 6.

In method (a), a flange at the engine end of the armature is bolted to the engine flywheel or crankshaft. Accurate alignment of generator and engine shafts is obtained horizontally by moving the generator on the bedplate, and vertically by the use of shims under the generator feet. When correct alignment has once been made, the generator feet are doweled in position. This is a very satisfactory method as it requires no mechanical connection between generator and engine frames and provides a simple well-known means of accurate shaft alignment. In some cases, a flexible coupling is used, but usually the mechanical connection between generator and engine shafts is solid.

Method (b) allows omission of the bedplate since the generator frame is supported directly from the engine frame or an adapter that is mounted on the engine frame. This method has the advantage over method (a) that the heavy bedplate under both engine and generator is not required. It is also convenient to build the adapter between generator and engine so that streamlined ventilating air outlets are provided and arrangement made so that ducts may be attached for carrying the air outside

*Transportation Design Engineer, Westinghouse Electric Corporation, East Pittsburgh, Pa.

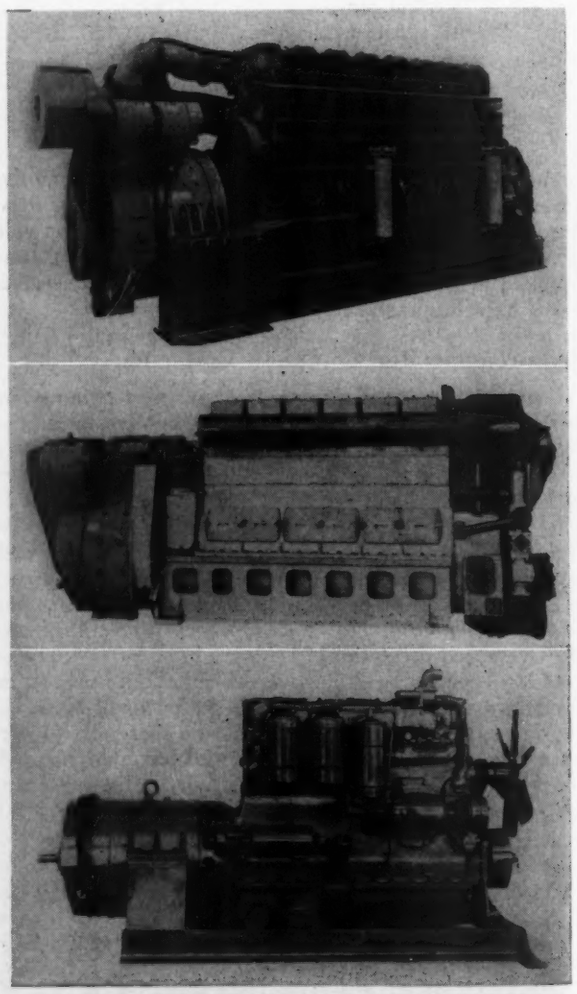


Fig. 6—The three common methods of mounting traction Diesel-electric engines and generators are: (top) on common bedplate; (center) generator supported from engine frame, and (bottom) engine and generator mounted as a single unit

the engine-generator compartment. The engine frame must be made heavy and strong enough to support the weight of the generator. Accurate shaft alignment is obtained by means of a spigot fit and the use of shims at the points where the generator frame is bolted to the engine frame.

Method (c) is commonly used on the smaller equipments. The entire power plant is treated as a unit and usually is supported by a three point mounting. In this case, a "bell-housing" is used between the generator and engine. A torsionally rigid steel-disk coupling, flexible to slight angular misalignment, is ordinarily supplied. This makes allowance for the slight angular shaft misalignment due to machining tolerances required at the circular fits of the bell housing. The generator ventilating air outlets are provided in this bell housing.

Smooth running of the generator depends both on

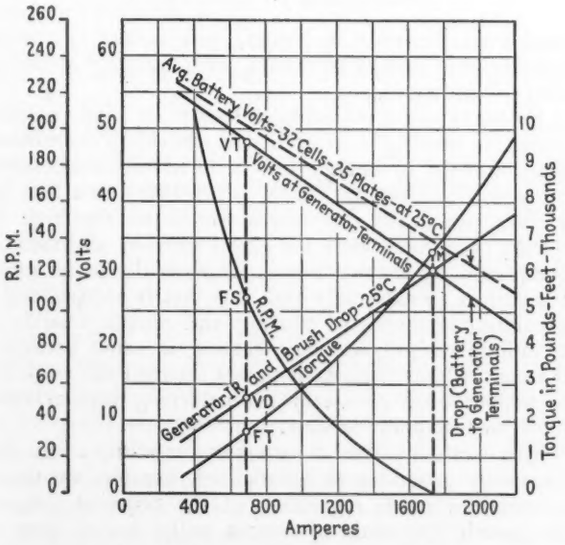


Fig. 7—The traction generator can be used as a starting motor for the Diesel engine—Above curves show characteristics when a series field winding is built into the generator and starting power taken from the battery

accurate shaft alignment and balance of the armature. Each armature is given a careful dynamic balance before assembly in its frame in order to insure this requirement.

Good performance of the single generator bearing is not a difficult problem since either a ball or roller bearing is used in accordance with well established and tried principles developed for these types of bearings. The bearing is ordinarily grease lubricated and requires service attention only a few times a year.

Brushholder and commutator behavior may be classed partly as mechanical performance. These parts, however, are designed and built with a background of experience not only on railway type generators but also that gained from years of operation of traction motors. These parts, therefore, give few mechanical troubles.

Use of Generator as an Engine Starting Motor

Experience has shown that the most reliable and simplest way of starting the engine is to use the main generator as a low-voltage starting motor that receives its power from the locomotive battery. It is fortunate that the generator, designed primarily as a power unit at relatively higher voltage also can be made into a satisfactory starting motor at the low voltages available from locomotive batteries.

Actually, the amount of power required to roll the engine over and turn it at firing speed is not large compared with the generator rating, but two important combinations of speed and torque must be satisfied:

(a) A torque sufficient to start the engine turning and get it over the first compression. This is ordinarily called breakaway torque. The speed at this torque is very low.

(b) A firing torque and speed combination that is enough to insure that the engine will fire and continue to run under its own power. The generator may be used as either a series or shunt type motor for engine starting.

Performance as a Series Starting Motor

When the generator is used as a series starting motor, a mainfield series winding is built into the generator especially for this purpose. This winding is connected in series with the armature and commutating pole windings. The resulting series motor is then connected directly to the battery terminals by heavy cables and two starting contactors. High torque is supplied at standstill and as the engine starts to rotate and the torque required becomes less, speed automatically increases like any d.c. series motor. A balance is reached at some speed where the torque supplied by the motor equals the torque required to spin the engine. This speed, of course, is dependent on the voltage that the battery supplies to the terminals of the generator acting as a motor.

Figure 7 shows a convenient method of plotting these series motor characteristics as obtained from a factory test. Volts, torque, and r.p.m. are all plotted against amperes. The top curve is the volt-amp. output of the battery to be used. The drop through the cables and

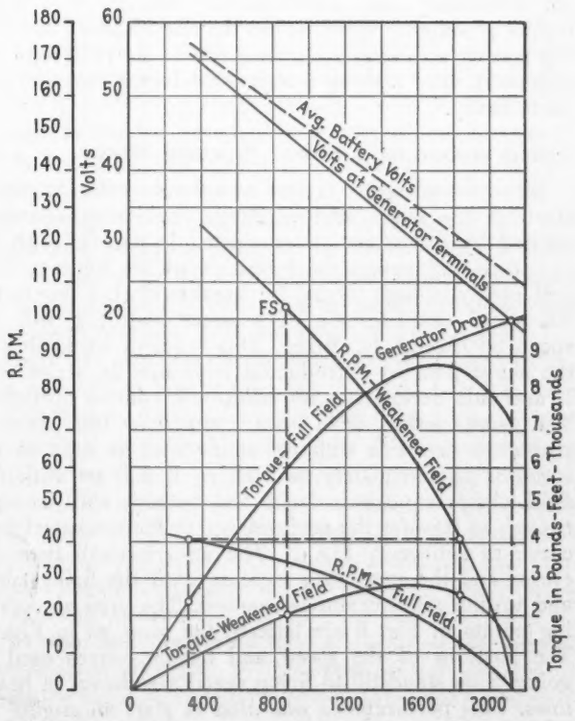


Fig. 8—The traction generator can also be used as a shunt-connected motor for starting the Diesel engine—Generally the shunt field must be weakened at some point during acceleration to reach firing speed

contactors is usually several per cent of the battery voltage. This must not be neglected, so a second curve is drawn representing the voltage that reaches the terminals of the generator. This particular curve is for a medium-sized generator (1,000 hp., 950 r.p.m.), but will serve as an illustration for any size. This generator was used to start an engine that required a breakaway torque of 5,000 lb.-ft. and a firing speed of 100 r.p.m. at 1,700 lb.-ft. torque. The point M is the maximum torque (6,600 lb.-ft.) available at standstill. This occurs at the ampere value where the terminal voltage supplied is all used up by IR and brush drop. Point FT is the required firing torque and the curve shows that 680 amp. are required for that torque and that the speed (point FS) is 107 r.p.m. In this case, therefore, both the required breakaway torque and the desired firing speed at the specified firing torque are satisfied. If this were not the case, it would be necessary to use a battery with greater voltage. This would increase both the maximum torque (by allowing more maximum amperes) and the firing speed (by increasing the terminal voltage at the amperes required for the firing torque).

With a curve such as that of Fig. 7 available for a certain battery, the performance with some other battery is easily found. The new battery voltage and the resulting generator terminal voltage are plotted on the same curve sheet. The intersection of the new terminal voltage curve with the generator drop line will give the new maximum ampere and maximum torque point. Since the volts represented by the distance VT-VD is the counter e.m.f. when running at firing torque and speed, the increase of this distance with the new battery will represent proportionately the new firing speed.

Use of the generator as a series motor for engine starting is without doubt the most convenient system, as it requires but one control operation and the series motor characteristic furnishes high torque at low speed for breakaway, and automatically changes to a lower torque at a higher speed. It has the one disadvantage that the special series field winding has to be built into the generator, thus making it somewhat larger, heavier, and more costly.

Performance as a Shunt Starting Motor

When the generator is used as a shunt motor for engine starting, the main field winding, ordinarily separately excited by the exciter, is connected in parallel with the armature and across the terminals of the battery. This will supply enough torque for breakaway, but due to the flat speed characteristic of a shunt motor, it will not speed up enough for firing. This requires weakening of the shunt field by introducing resistance in series with it and this necessitates an additional control operation. The usual method is to open a contactor that shorts a resistance in series with the shunt field as soon as the speed is approximately as high as it will go with full field. Amperes drawn from the battery will increase enough to transfer the performance to the weakened field curve as shown in Fig. 8. The amperes will then decrease and the speed will increase until the firing speed and torque requirement is reached. The critical operating points in Fig. 8 are lettered the same as in Fig. 7. The portions of the speed and torque curves used in going from standstill to firing speed are shown in heavy lines. This performance was used to start an engine requiring 7,000 lb.-ft. breakaway torque and 2,000 lb.-ft. firing torque at 90 r.p.m.

It is seen, therefore, as stated at the beginning of Part I of this article that the Diesel-electric locomotive generator has a number of requirements that make it distinctive as a type of direct-current generator. Due to the wide variety of horsepowers and speeds of Diesel engines being manufactured for locomotive service, a correspondingly large number of generators must be available. The present trend toward engines of higher hp. and r.p.m. prevents permanently fixed standard designs. The fundamental features of performance as electric power generators and as engine starting motors outlined above, however, apply generally to Diesel-electric locomotive generators.

Commutator Soldering By High Frequency Heating

(*Continued from page 453*)

section of the riser is heated, independent of the fact that the heat generated occurs predominantly at the surface of the metal.

Probably the most striking feature of high frequency induction heating is its ability to transfer a concentrated large amount of energy into a relatively small volume of metal. In effect, the work coil behaves as a lens, and focuses practically the entire output of the high frequency generator into the small number of risers encompassed by the work coil. This results in an energy transfer of an extremely high rate that is unparalleled by conventional means of heating and makes possible the technique of progressively heating a small section of the commutator neck as it passes through the work coil, to temperatures necessary for soldering with relatively high melting-point solders.

This method allows the greatest versatility of the high frequency generator to be realized, because almost any commutator neck, regardless of the physical size, can be heated. The mass of copper to be heated does not vary appreciably for the different types. Assuming optimum operation of the induction heater, the temperature of the riser is controlled principally by varying the speed of the riser passing through the work coil.

The preliminary work for preparing the commutator risers for soldering involves the usual procedure of cutting off that portion of the leads extending through the risers, and taking a light facing cut in a lathe. Solder in the form of a paste is then applied to the top and face of the risers, and as the soldering operation proceeds, ordinary hard wire solder is used to touch up the soldering of individual risers. The solder paste consists of finely powdered solder, dispersed in a neutral resin flux which has a sticky putty-like consistency which inherently makes it easy to apply to the riser. At the same time, it provides sufficient flux to insure protection from oxidation while soldering, a prerequisite for good soldering.

The equipment set-up includes not only the high frequency generator unit and work coil, but also the necessary facilities, which are sufficiently flexible in construction to accommodate the inevitable variety of armatures. Similarly, the design of the work coil is focused toward obtaining a universal coil which can be used for heating several different types of commutator necks, regardless of the shape of each type and make. Relatively few sizes of work coils are needed to heat the risers of the majority of traction motor and generator armatures.

EDITORIALS

Mechanical Division Reports Progress

At the annual June meeting of the A.A.R. Mechanical Division, as reported fully elsewhere in this issue, ample evidence was afforded of the completion of another year of honest endeavor and useful service by this body of men representing the mechanical departments of American railroads.

It was pointed out that some of the committee assignments have been completed and definite recommendations made. In other cases further investigations and studies are being conducted. For example, the No. 18 brake beam, which became the new A.A.R. standard on March 1 of this year, presented a number of problems and various questions and the Arbitration Committee suggested modifications of interchange rules to provide charges and credits, proper substitutions and various other details, as required.

Trouble with excessive brake system air leakage in northern areas was strongly emphasized and this matter is being closely studied, not only by the brake committee but by qualified representatives of all railroads and the air brake manufacturers. Higher speeds and longer freight trains, as well as other changed operating conditions, necessitated discontinuing present condemning limits for worn flanges of cast-iron wheels of 80,000 lb. capacity and over since broken flanges have been reported where the flanges were worn excessively. The Committee on Wheels recommended reinstatement of former condemning limits for cast-iron wheels of 80,000 lb. capacity. A special committee is studying the matter of prevention of steel-wheel failures under Diesel locomotives, and passenger-train cars.

Some railroads have been changing over to grease lubrication for journal roller bearings in passenger-train cars. The Committee on Lubrication of Cars and Locomotives has collaborated with various oil companies and journal roller bearing manufacturers in the development of an A.A.R. specification to cover greases which will best serve this purpose. The development work is expected to take some time, and consideration has been given to the preparation of an approved list of greases for general use in the interim.

The Committee on Couplers and Draft Gears reported a busy year. Check tests of new draft gears manufactured in Canada have been completed and the check tests of certified draft gears after 5 and 12 years of service have also been finished. The Committee on Geared Hand Brakes offered a modified form of power test, which is less extensive than that formerly required, for letter ballot approval in its report and also amplified the present specifications for geared hand brakes.

In its report this year, the Committee on Development of Hot-Box Alarm Devices included some interesting data covering test observations of various types of hot-box alarm devices which have been used on various roads. In connection with standardization of details in common use on railroads, it was pointed out that various manufacturers of Diesel locomotives, for example, bring out their products with variations in design, which now present a difficult problem to railroads, thus showing the importance, in the early development of any new product or machine which gives indication of general railroad use, of standardization of components requiring replacement.

Cheap Insurance Being Passed By

One of the more certain signs of the times in motive power thinking is the rapidly changing attitude toward the size of drop tables being installed in new Diesel shops. For quite a number of years railroads bought drop tables for Diesel shops that were long enough and deep enough to handle steam locomotive drivers in emergency. Today the new tables are long enough in only about half the cases, and are seldom deep enough for steam work should the occasion arise. An interesting question is why.

A drop table for a single pair of wheels has to be long enough to handle the wheels with the traction motor in place, requiring a bare minimum length of about five feet to allow a little clearance. Two more feet would make it long enough to handle steam drivers in emergency, and would add negligibly little to the overall cost. Another few feet added to the excavation depth would overcome the depth limitation, and again at small additional cost once the equipment is on the spot for the digging.

There are two good reasons for going to drop tables that are at least bigger than the 5½- and 6-ft. pits. One is that future developments in Diesel and gas turbine locomotives may trend toward rigid frame designs with larger drivers, such as the 57-in. drivers on the Pennsylvania GG-1 electric locomotives. Roads with today's small tables would be faced with quite an expensive alteration should this occur. The small additional cost for bigger installations now would certainly seem to be bargain-rate-insurance.

A more ominous reason can be found in the present international situation. In the event of war most roads would be faced with no alternative to handling the additional traffic with steam power. Diesel locomotives are too expensive to buy in sufficient quantities to handle substantial traffic increases that may or may not occur. Only the bare minimum to handle normal loads can be

afforded. Thus, prolonged traffic increases, as would result from a national emergency, would probably be handled with steam.

It may be argued that with shops dismantled and road servicing facilities already torn down, there would be no chance of running steam. As far as coal docks and cinder pits are concerned, their need could be eliminated by converting to oil. Where this is not feasible, some facilities would, of course, have to be built, but there is no reason why new drop-pit facilities need be provided if foresight is exercised when Diesel drop pits are built.

Maintenance Costs vs. Locomotive Performance

The question of how long traction-motor armature coils should last in service was discussed in the June 1950 issue. It was pointed out that coil life varies greatly. Armatures may fail at 300,000 miles and they may have a life in excess of 1,500,000 miles. It may or may not be desirable to get very long coil life. If it can be obtained by better insulation, it is good. If it must be obtained by operating locomotives below rated capacity, it may be too high a price to pay for the increase in life.

To the operating man, it is most important that he does not have road failures. He would like to have advance notice of any such demise. If it were possible he would like to have a coil, which had about terminated its life span, say, as did the Roman gladiators, "We who are about to die, salute you."

Perhaps this idea is not as fanciful as it appears. Tests made recently with silicone insulation show that when a coil picks up moisture easily, as indicated by a change in insulation resistance, the insulation has crazed and should not be depended upon for long continued service. A secondary effect of such crazing is that the cold resistance of the coils will increase because of the oxidation of the copper.

The tests also showed that while silicone coils could withstand a hot-spot temperature of 220 deg. C for seven years, it could be expected that insulation life would be cut in half with each 12-deg. C. rise in temperature. Of course, other factors enter into the situation. Frequent thermal cycling will reduce life. Excess vibration due to worn or badly aligned gears or rough track will take its toll. Quality of workmanship in winding or rewinding will have its influence and the kind of insulation used will affect total life.

In spite of these variables, it is beginning to appear that some measure of life versus cost of repairs can be taken. On one railroad, the number of motors coming in for general overhaul which must be rewound amounts to 30 per cent. On another road, it is 60 per cent. Is the road with the higher number of rewinds paying too much for maintenance or is it getting more than this amount back in the form of added revenue by getting increased performance out of its locomotives? Somewhere there is a balance between these factors and it would probably pay most operators to learn where it is.

It's Almost Never As Bad as It Looks

Just about a year ago the railroads were greatly concerned over the potential effects of the institution of the 40-hour week. During the meeting of the A.A.R. Mechanical Division at Chicago in June, 1949, a railroad officer made the statement that "It has been estimated that *if we go along as we have in the past with present work methods* [the italics are ours] it will require more than 200,000 additional employees and will cost the railroads close to 510 million dollars a year—which will be the same result as though an increase of 23½ cents an hour had been granted to all non-operating employees."

In commenting editorially on the statement made at that time it was suggested that the inauguration of the 40-hour week not only offered the railroads an opportunity to do a lot of things that should have been done before but it actually imposed upon them an obligation, if not the absolute necessity, of doing a great many things in the way of installing labor-saving facilities that they had been somewhat indifferent to prior to that time. Faced with the possibility of tremendous increases in costs at a time when they also faced the possibility of declining revenues due to business conditions and the intense competition of the post war period it didn't take too much consideration for them to decide that they must move rapidly to effect economies that would at least offset a substantial part of the expected increases in the cost of doing business.

Much credit is due the roads for being practical-minded enough to realize that if major economies are to be effected in the shortest possible time it is but logical to invest money in the place where the greatest savings can be expected. Therefore, the decision to replace obsolete motive power has resulted in a year in which the installation of Diesel-electric locomotives accomplished *immediate* economies in operating expense and promises *long-term* savings in maintenance expense, too.

Buying new locomotives to effect short-term reductions in repair costs is not exactly a new idea and can very well be one that may come back to cause difficulties when the mileage that was bought with the new power has been run out unless the replacement of obsolete power by new power is part of a broad program to control motive power operating costs by the installation of collateral facilities that enable the new power to function with the greatest degree of efficiency. So, once more, we give the railroads credit for having made substantial expenditures for new shop and terminal facilities for Diesel power which, to quote some mechanical people, have fallen a long way short of what should have been done to assure that this new type of power can be maintained at a cost within reason. Incidentally, we'd like to add that the roads have spent almost nothing to modernize the facilities with which steam power is serviced and maintained in spite of the fact that there are still 26,921 steam locomotives in service in this country.

It is significant that the mechanical officer who made the statement referred to previously is one who has been unusually aggressive in fighting for modern methods.

modern facilities and modern ideas in the handling of personnel—one who has not been at all backward in presenting his ideas to the railroad industry at any and every opportunity. We do not know exactly what he may have had in mind in venturing the predictions that he did but they *were* made at a time when the fall meetings of the Co-ordinated Mechanical Associations were not too far away. Of the 3,000 men who convened at Chicago last September to discuss the ways and means of controlling the rapidly rising expenses related to the maintenance of equipment probably not one went to the meetings of the Car Department Officers', Master Boiler Makers', Locomotive Maintenance Officers', Air Brake, Railway Fuel, and Electrical Sections who didn't have a pretty good idea that he was there to get all the information he could on how money could be saved for the railroad that sent him to the meetings.

The opportunities that existed a year ago to effect economies in the field of equipment maintenance have, since then, been multiplied many times and the work that these associations are doing has added immeasurably to the value of the information that, by their work, is disseminated to the more than a quarter of a million or so employees in the mechanical departments of the railroads of the country.

What of the results? In August, 1949, the mechanical and stores departments of the Class I roads had 308,000 employees who drew 94 million dollars in wages. In April, 1950, these same departments had 343,000 employees who drew 93 million dollars in wages. With the exception of an increase of 101 employees in the daily-paid classification all of the increase in employees has been in the hourly-paid group. The saving has been in high-priced man-hours—and that's what modern facilities are best equipped to do.

In the face of the year's record can anyone conclude that attendance at the fall conventions last year, which were held just as the 40-hour week was getting under way, did not contribute to the results? No doubt many other influences were also effective, but the inspiration and information from these meetings were a definite influence too. They can be just as effective again this year.

Preventing Diesel Crankcase Explosions

Explosions continue to occur in Diesel locomotive crankcases with all too great frequency, and the results, while probably less spectacular than some steam locomotive boiler explosions, always present potential hazards to life and limb, not to mention damaged equipment, delayed trains, increased costs and sometimes other serious consequences. The answer to this difficulty on any railroad is apparently the development of an organized program of periodic inspection and maintenance designed to assure the correction of mechanical defects which, either singly or in combination, contribute to the risk of crankcase explosion. A thorough training of all Diesel locomotive personnel in the details of this program and an unremitting campaign to see that the work is faithfully done are obvious essentials.

Current interest in the subject of Diesel crankcase explosions is evident from specific discussion at the A. A. R. Mechanical Division meeting in Chicago during the last week in June where it was explained that these accidents are generally due to explosive mixtures of fuel vapor and air coming in contact with flame or an overheated part of the engine. Operating and maintenance crews have little control over the mixture of vapors with air in Diesel crankcases, but they can prevent or correct mechanical defects primarily responsible for explosions, the most common of which are said to include: piston seizures; excessive piston blow by; failure of oil supply due to plugged screens or oil lines; contamination of lubricating oil with water or fuel oil, causing bearings to overheat; misalinement or misapplication of bearings with attendant overheating of bearings and shafts; metal in the oil system causing bearings to overheat.

Typical railroad experience with crankcase explosions is illustrated by the statement of one officer at the meeting referred to that five instances occurred on the Northern Region of his road in 1949, being classified as mild explosions since only the top deck covers were dislodged, the crankcase and airbox covers remaining intact and no personal injuries or serious train delays resulting. He said there were no explosions on the Southern Region of this road during 1949, but an investigation of delays indicated at least seven instances when engine conditions existed conducive to crankcase explosions.

These conditions can be corrected before trouble occurs by rigid inspection and correct maintenance.

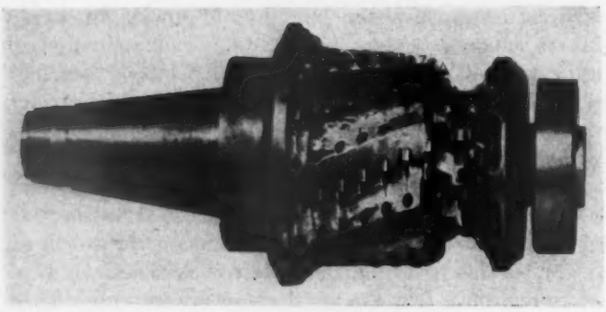
NEW BOOKS

KENT'S MECHANICAL ENGINEERS' HANDBOOK. *Twelfth edition, in two volumes*: POWER, *J. Kenneth Salisbury, editor;* DESIGN AND PRODUCTION, *Colin Carmichael, editor. Published by John Wiley & Sons, 440 Fourth avenue, New York 16. Price, each volume $8.50.*

Power covers basic components of any power process (air, fuel, heat and steam); the service functions, pumping and piping; power-producing equipment (boilers, turbines, condensers, and gas turbines); refrigeration, heating, ventilating, and air conditioning; transportation (Diesel engines, land, air and marine transportation); electric power; atomic energy, instrumentation, power test codes, and mathematical tables. New material covers all phases of the gas-turbine field from theory to operation, with particular attention to locomotive and marine installations; recent data on coals; tabular data on the characteristics and specifications of modern Diesel locomotives; air and marine transportation; elements of the basic science of nuclear engineering, and a presentation of possible methods of conversion from nuclear to electric power. *Design and Production* has been almost completely rewritten. It is directed primarily toward engineers concerned with the design and manufacture of machinery, appliances, mechanical equipment and other engineered products.

NEW DEVICES

Standard Wheel-Truing Machine Developed



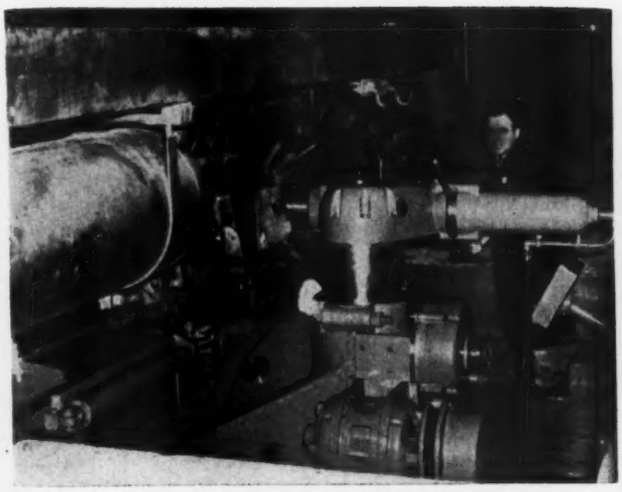
The full-contour carbide-insert milling cutter

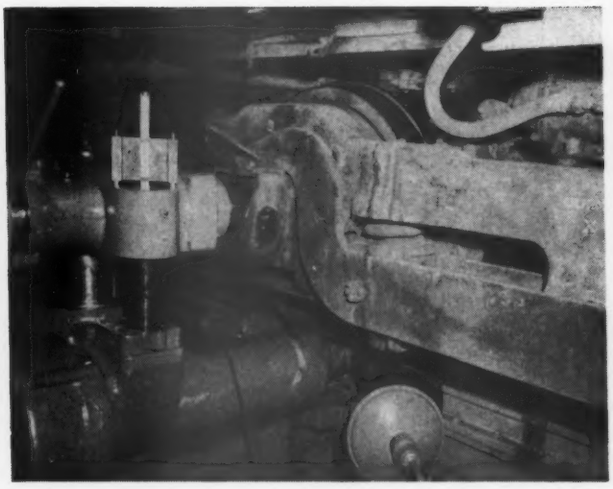
After extensive research and development work, the Standard Railway Equipment Manufacturing Company, Chicago, has recently announced a wheel-truing machine which, for the first time, permits restoring the full standard flange and tread contour of worn Diesel locomotive wheels without removing either the trucks or wheels from under the equipment. The Elgin, Joliet & Eastern co-operated by making its Joliet, Ill., locomotive shop available as a proving ground, and here the first machine was installed about three years ago in a pit under one of the shop tracks; developed through numerous stages and growing pains to its present design; and demonstrated to hundreds of railway officers in the past year.

At present the overall time for retruing a single pair of wheels on this machine includes 10 min. set-up, about 25 min. for one cut on 42-in. wheels and 5 min. taking the machine down, or a total of 40 min. For most wheels, the truing operation can be completed in one cut, including high-flange wheels if that is the only defect. If the flanges are thin and considerable tread metal must be removed in restoring the flanges two or more cuts may be required. Treads of the two wheels on each axle are machined to the same size and concentric with their respective journals to an accuracy of about .005 in. on the diameter.

In actual practice, it has not been found necessary to hold a Diesel switcher out of service more than 8 hr. for wheel truing by this method which may be compared with two or more days when the wheels have to be removed for turning in conventional wheel lathes. In addition, therefore, to labor saved in not dropping the wheels for turning, locomotive availability is increased appreciably. Also the ability to take a skim cut, if that is all that is needed, through hard as well as soft spots conserves wheel

Standard wheel-truing machine ready for a Diesel switcher to move into place over it





Left: The wheel-truing machine with all adjustments made, ready for operation—
Right: A closer look at the roller drive and cutter on the opposite side of the locomotive

life since tread metal is rated at about 10,000 miles per $\frac{1}{16}$ in. of depth. The estimated cost saving per set of four pairs of Diesel switcher wheels trued by this method is $300, exclusive of benefits from increased locomotive availability and additional life.

The machine itself is a floating milling machine mounted on a universal joint and consisting essentially of two individual components. First, the milling unit is a large floating C-shaped frame, weighing approximately 26,000 lb. This frame supports the cutters and the tail-stocks, or centers, which are set into the axle centers of the wheels being turned. The depth of cut is obtained by simultaneously raising the C-frame and lowering the tail-stock, or centers. Two 25-hp. motors drive the cutter spindles at 105 r.p.m., the cutters being adjustably positioned under the wheels.

The second portion of the machine is the driving mechanism, consisting of a dual set of sliding-rail sections which hold the wheels to be milled firmly against knurled rollers bearing against the flanges and designed to revolve the wheels at a constant speed of 6½ in. per min. during the milling operation. In this particular instance, experience indicates that climb milling, or revolving the cutters in the opposite direction from the wheels being trued, produces the best overall results. Two operators are required, one working on each side of the machine.

The special cutters developed are probably the first successful attempt at contour milling in material of 400 to 500 Brinell hardness. Each of the two solid cutter bodies is bored to accommodate more than 90 carbide inserts, arranged in eight spirals to form the full wheel contour. These inserts are cylindrical, $\frac{5}{8}$ in. in diameter and ½ in. thick. Since only $\frac{3}{32}$ in. of the insert protrudes above the cutter body, worn cutting surfaces are renewed by revolving the insert slightly to bring a new arc of contact. When one side of the insert has been completely dulled by a series of 8 to 10 adjustments, the insert is reversed in the cutter and the second side similarly used up.

These inserts are placed so as to have a 6 deg. negative rake angle, which also provides the same angularity for cutter clearance. In general, the inserts need no attention in truing at least four pairs of wheels.

In operation the Diesel locomotive is moved over the pit, the wheel-drive rollers raised and the pair of wheels to be trued moved against them. The other pair of wheels on this truck is wedged and locked to the rails to prevent movement of the truck. The retractable rails are hydraulically moved away to allow for raising the wheel-truing machine.

The wheel-truing machine is raised into operating position and the tailstock centers engaged with the wheel axle centers. The wheel drive rollers and the cutters are started and the depth of cut is adjusted by electrically operated feed screws. One revolution and cut on the wheels, or more if required, restores the full flange and tread contour of both wheels. On completion of machining, the machine is lowered, rail sections re-positioned, truck wheels released and the locomotive can then be moved for retruing the next pair of wheels.

Charging Equipment For Battery Trucks

New single-circuit rotating-type battery-charging equipment for electric industrial trucks has been announced by General Electric's Small and Medium Motor Divisions.

Versatile and fully automatic, the new equipment has more than 2,000 available adjustments of charging characteristics, and meets the charging requirements of all manufacturers of industrial batteries to provide maximum battery life and output. Available in two models, the new charger is adaptable to, and includes all components for both lead-acid and nickel-iron-alkaline batteries.

Automatic features of the new equipment include battery cut-off and charger shut-down when battery is fully charged. There is also automatic disconnection of the charger from the power line and opening of the charging circuit in case of power interruption, and automatic restart of the charger upon resumption of service following an interruption. Control of the charging rate under the modified constant voltage charging system is also automatic.

The chargers are protected against generator or motor overload. They are of completely enclosed, dead-front, construction and have reverse-current protection and a polarized battery circuit which assures correct connection of battery leads.

Adjustable for all voltages and currents required by driver-ride type electric industrial truck batteries, the equipment readily can be made portable.

One of the new models covers lead-acid batteries of 12 to 20 cells up to 530-amp.-hr.-capacity and 21 to 24 cells up to 450 amp.-hr., and nickel-iron-alkaline batteries

of 20 to 24 cells up to 500 amp.-hr. capacity and 25 to 30 cells up to 460 amp.-hr. The other model covers lead-acid batteries of 12 to 20 cells up to 750-amp.-hr. capacity, and 21 to 24 cells up to 630 amp.-hr., and nickel-iron-alkaline batteries of 20 to 24 cells up to 700-amp.-hr. capacity, and 25 to 32 cells up to 600 amp.-hr.

Both models operate on 220/440-volt, 3-phase, 60-cycle power supply. They weigh 330 and 390 lb., and measure respectively 22 9/16 in. x 12 in. x 27¼ in., and 23 1/16 in. x 13 in. x 32 5/16 in.

Machine Cleans Axles for Inspection

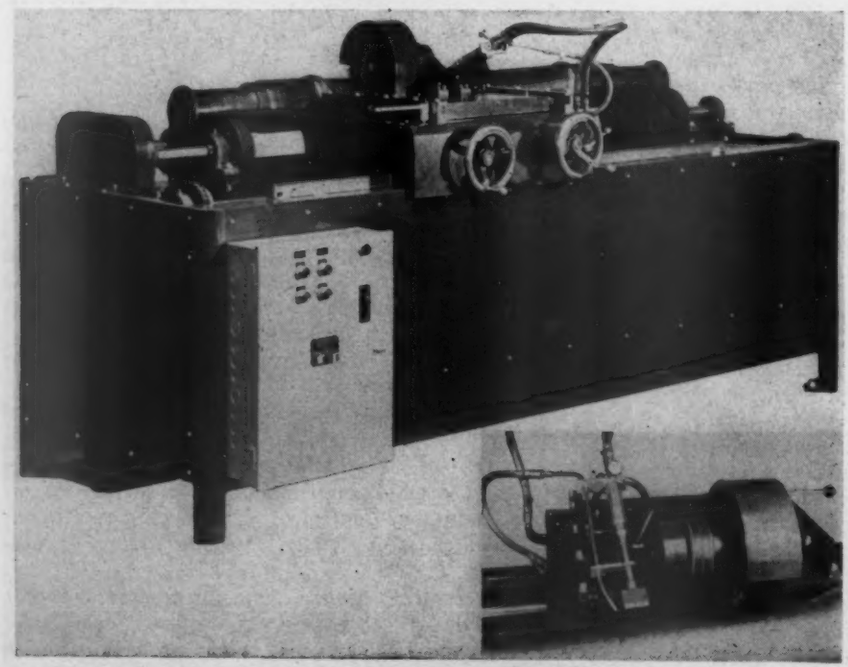
A pilot model of a railroad axle cleaning unit has just been completed by the Magnaflux Corporation, 5900 Northwest Highway, Chicago, and has been under test in a midwestern railroad shop. The machine employs a combination of flame and wire brush cleaning to prepare the axle for either Magnaglo or Magnaflux Dry Powder inspection, the requirements for the former being free from all loose dirt, scale and foreign matter, and for the latter dry and free from any oil film.

The machine is known as the Type XAC Axle Cleaning Unit, and is designed to clean axles by the use of the wire brush either with or without the flame. A movable carriage supports the high-speed wire brush and the flame attachments, with provisions for both powered and hand traverse. The carriage fixtures are designed to accommodate flame torches and controls supplied by either Air Reduction Sales or Oxweld Railroad Service. A cross slide on the carriage allows the brush and flame to follow the contour of the axle, with the brush pressure against the axle automatically maintained. The unit has an automatic flame cut-off whenever the axle stops rotating to prevent overheating any part of the axle as long as the carriage holding the oxy-acetylene torch was traversing.

Axles are brought to and removed from the XAC Machine by an overhead hoist or jib crane. After the dirty axle is placed on the rotation rollers, the necessary adjustments for the axle are made. If flame cleaning is required, the flame is manually turned on and the traverse clutch manually engaged. The carriage is then power driven to the right hand end of the unit where the clutch is automatically disengaged, stopping the powered traverse and cutting off the flame at the cleaning head. The cross slide is manually retracted and the carriage returned to the left hand end of the unit by the handwheel. The axle is removed with the same equipment used for loading. There is no noticeable temperature rise in the axle immediately following the flame cleaning. This remains true after even two or three consecutive passes with the flame.

The machine has a rate of power traverse of 30 in. per min. and a manual return of 9 in. per revolution of the hand wheel. The wire brush is direct driven by a 5-hp. 3,600-r.p.m. motor; the axle is driven through a speed reducer at 32 r.p.m. by a 1-hp., 1,800-r.p.m. motor. The wire brush guard is designed to deflect particles into a trough at the rear of the machine.

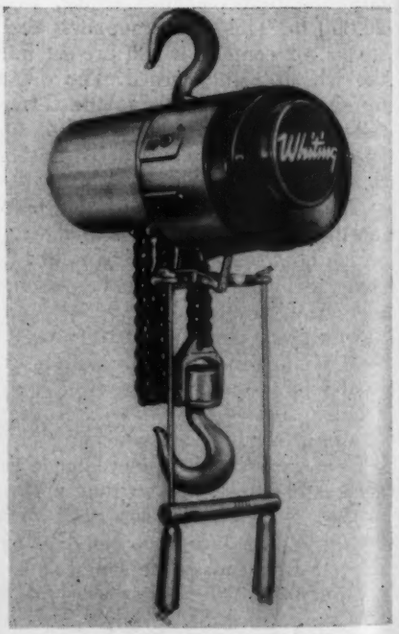
Cleaning time averages about four minutes per axle, including the handling; the average flame time is approximately 2.5 minutes per axle. The volume of the gas consumed per axle when the flame is used is approximately 6.8 cu. ft. of oxygen and 6.3 cu. ft. of acetylene.



Pilot model of the XAC axle cleaning unit with inset showing a close-up of the flame and wire brush cleaning combination

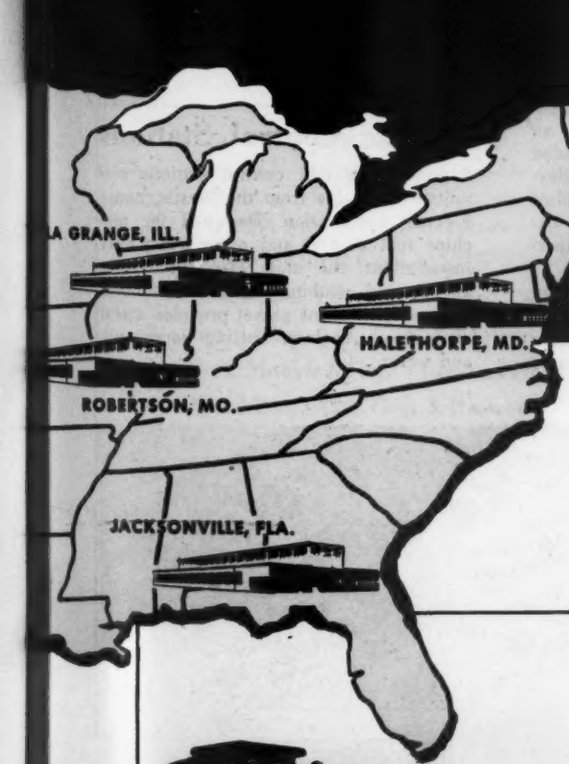
Electric Chain Hoists

A complete, improved line of Whiting electric roller-chain hoists has just been announced by the Whiting Corporation, Harvey, Ill. The redesigned hoists retain the totally enclosed, double worm-gear drive of previous models, but many parts have been simplified and strengthened.

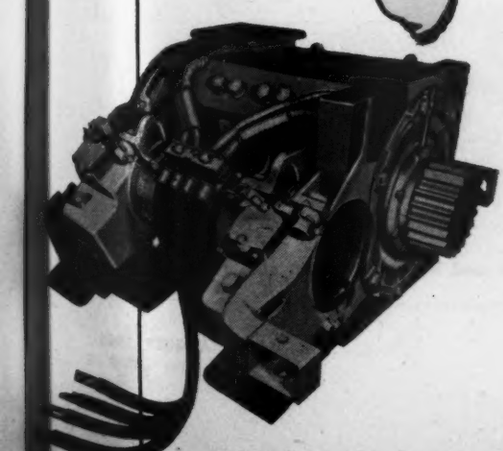


The improved line of Whiting electric chain hoists is available in capacities of ¼, ½, 1 and 2 tons

The hoists use a spring-seat, shoe-type motor brake, in which the lining is bonded to the shoe, to provide improved braking power and longer brake life. The pull cord has been relocated at the center, instead of the end, of the hoist frame, to eliminate any tendency of the hoist to tip when the



Factory-trained inspectors working with the latest, most modern gauges, fixtures and electrical test equipment assure top performance of traction motors and other components rebuilt by Electro-Motive.



ELECTRO-MOTIVE DIVISION

GENERAL MOTORS • LA GRANGE, ILL.

Home of the Diesel Locomotive

GENERAL MOTORS LOCOMOTIVES

control cord is pulled. The hoist control switch also is relocated and simplified, and protected from damage by a new switch mounting. The switch wiring is accessible by removing the hoist nameplate.

The alignment of the motor is insured by locking the adapter casting in position. In the two-ton hoists, a built-in hook provides 2½ in. reduction in headroom. Many of the stamped parts used in earlier Whiting Hoist models have been eliminated, to provide greater simplicity and ruggedness.

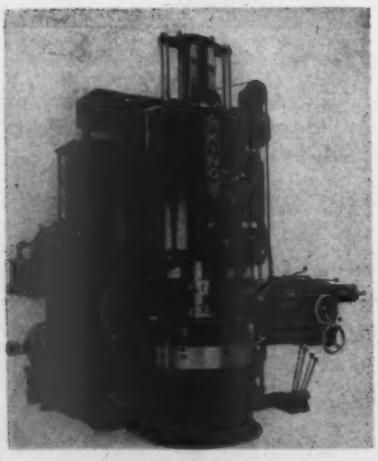
These Whiting Hoists are available in ¼-, ½-, 1-, and 2-ton capacities.

Grille Controls Supply Air Volume

The regulation of individual room supply air volume is furnished by a combination grille and volume adjuster made by the Barber-Colman Company, Rockford, Ill. Known as the Uni-Flo Voladjuster, the device is manufactured in several sizes suitable for train air conditioning systems.

The air volume is regulated by a damper located behind the supply grille and positioned by a wall-mounted adjusting dial. Accurate volume control and minimum air disturbance are produced by the opposed blade damper which can be located to control the volume from one or several outlets. A pointer on the adjusting knob indicates the damper position from full open to fully closed. Stainless steel wire operating in a flexible protecting sheath transmits the action of the pointer to position the damper.

Diesel Wheel Boring Mill



Illustrated is the latest development of the King Machine Tool Division, American Steel Foundries, Cincinnati 29, Ohio. A unit similar to this wheel boring and facing machine, recently installed in a plant making Diesel locomotives, is said to have increased wheel production about 50 per cent.

Rigidity has been achieved by the use of a heavy fixed rail, which carries the over-sized boring ram and hydraulic-feed cylinders. The ram uses a square type construction permitting accurate alignment and easy adjustment by four large gibs. The cycle of this ram is fully automatic and can be set to rapid traverse to the work, rough bore at one feed, finish bore at another feed, form a radius at another feed, then dwell and rapid traverse out of the work.

A special motor-operated power chuck holds the wheel accurately and securely and speeds up the loading and unloading operations.

The separate hydraulic power unit for actuating this boring head is located on the side of the machine. An over-sized side head assembly permits full use of the carbide tooling even while extended to machine the hub details.

Unit Package for Lowering Hangers

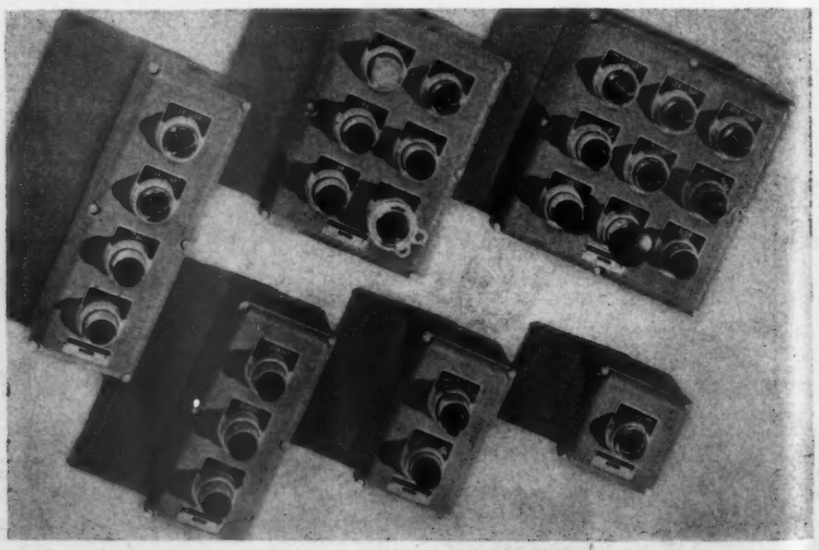
The Thompson Electric Company, Cleveland, Ohio, has announced four new all-aluminum unit packages which have been developed especially for all types of outdoor lighting installations. These packages contain a complete Thompson disconnecting and lowering hanger, a lighting fixture adapter (for either pendant or yoke-type fixtures), a slip-fit elbow, bracket end, U-bolts, filler blocks, a fixed position corner pulley, a specified length of galvanized chain, and (optional) an open-type lock box with a spring-loaded terminal link or a fully enclosed, pulley-equipped lock box for use with conduit enclosed vertical chain runs. The enclosed lock box is weather and tamper-proof.

These unit packages facilitate continuous, safe, and easy lighting fixture maintenance. They are of all-aluminum construction and have a baked aluminum plastic enamel coating to assure greater resistance to weathering and corrosive atmospheres.

The new aluminum hangers are approximately 50 per cent lighter in weight than the malleable iron units in the standard line, reducing the structural strength requirements for supporting members and increasing ease of installation. All load carrying members are fabricated from high-strength heat-treated aluminum alloy.

Oil-Tite Control Stations

A line of oil-tight control stations and units is available from the Westinghouse Electric Corporation. Designed for machine tool control and other heavy-duty installations, the units can be used in any desired combination in the stations. A durable resilient gasket provides a seal against oil, coolant, cutting compound, and water.



Assorted arrangements of control buttons and indicator lights

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STANDARDIZED BRUSHES

at a BETTER PRICE for a BETTER PRODUCT in a BETTER PACKAGE

Our years of standardization work boil down to this: you get the grade used originally, or a newly-developed superior grade, in a new, simplified method of carbon brush purchases. You make a substantial saving in ordering, billing, stocking and transportation.

HERE ARE A FEW OF THE BRUSH ITEMS YOU CAN NOW ORDER FROM STOCK:

TYPICAL APPLICATION	BRUSH No.	SIZE (inches)	GRADE	Standard Package
● West. SK Motors & Generators	NC 12–3202	1¾ x 1 x ⅜	255	50
● GE CD Motor & Gen. (15/15°)	NC 12–4003	2 x 1¼ x ⅜	255	50
● Diesel-Elec. Loco. Main Gen. (30/30°)	NC 12–4819	2¼ x 1½ x ⅜	SA-35	100
● Diesel-Elec. Aux. Gen. & Blower	NC 16–3220	1¾ x 1 x ½	SA-3538	100
● West. Motors & Gen. (Tandem Holders)	NC 16–5603	2½ x 1¾ x .492	SA-35	100
● Diesel-Elec. Aux. Gen. & Blower	NC 20–3220	2 x 1 x ⅝	259	100
● Diesel-Elec. Main Generator	NC 20–4202	2 9/16 x 1 5/16 x ⅝ (5/16-5/16)	SA-3590	100
● P.C.C. Car Motors	NC 20–4810	2 x 1½ x ⅝ (5/16-5/16)	AX-5	100
● Diesel-Elec. Traction Motor	NC 20–6420	2⅛ x 2 x ⅝ (5/16-5/16)	AZY	100
● Diesel-Elec. Main Generator	NC 24–4024	2½ x 1¼ x ¾ (⅜-⅜)	255	100
● Diesel-Elec. Traction Motor	NC 24–5620	2 x 1¾ x ¾ (⅜-⅜)	AZY	100
● Diesel-Elec. Traction Motor	NC 24–7215	2 x 2¼ x ¾ (⅜-⅜)	AZY	100

Complete lists of standardized brushes supplied on request

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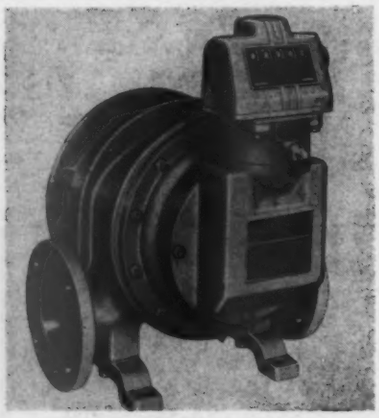
ORDER BY "NC"
STANDARDIZED BRUSH NUMBER

Units and nameplates can be rotated 90 deg., 180 deg. or 270 deg. to enable mounting in any position. Terminals on the contact block are reversible for front and rear connection.

For surface mounting, the stations are available in die-cast enclosures with Bonderized baked enamel finish. Contact blocks can be mounted in the base, eliminating flexible leads from box to cover. When it is desired to mount the units in machine cavities, or in banks in large control stations, the contact blocks can be cover-mounted.

Five types of operators, with matching pilot lights, provide for unit flexibility. A wide variety of contact arrangements is available so that complex control applications can be handled with simplicity. Operating heads and contact blocks are both interchangeable to provide flexibility and reduction of inventory.

High Speed Rotary Meter



A new 350 gallon per min. rotary meter, at working pressures up to 125 lb. per sq. in. known as the Rotorol, and designed for tank truck, bulk plant, tank car, pipe line, industrial, high-speed fueling and other liquid measuring jobs has been announced by Bowser, Inc., Fort Wayne 2, Ind.

Dynamic balancing of the rotor assembly preserves accuracy and lengthens meter life by eliminating hydraulic and mechanical stresses.

Stainless steel ball bearings and needle-type roller bearings on the rotor shaft and cam rollers offer little resistance to liquid flow on gravity or pump installations. Interior rotating parts are aluminum die cast, anodized aluminum and cadmium plated steel to resist corrosion.

Positive displacement measurement is accomplished in a chamber during each quarter revolution of the rotor. A simple gear change permits flow through the meter in either direction.

The meter may be installed vertically or horizontally and is available with large-numeral, straight reading dial or ticket printer. The dials can be set to face any of eight directions.

Rectifier-Operated Resistance Tester

A rectifier-operated Meg-type of Megger insulation tester is now being offered by the James G. Biddle Company, Philadelphia, Pa.

The instrument is designed for testing control circuits, lighting and power installations, generators, cables and other equipment in which the dielectric absorption effect is significant. Such tests involve careful observations of insulation resistance with time up to 10 or more minutes. It may also be used for testing multi-conductor communication cables, as in telephone plants, power circuits in railway signal installations and for experimental and laboratory use.

In the rectifier-operated instrument, the hand generator is replaced by a power-pack consisting of a constant-voltage step-up transformer and selenium rectifier, giving a constant d.c. test voltage. The megger true ohmmeter, covers a wide range independent of supply voltage.

Locomotive Cleaning Hose

A rubber hose especially for carrying the hot oil and water used to clean steam locomotives has been designed by the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown 1, Ohio. The hose has an inside diameter of ¾ in. and is available in standard lengths of 50 ft.

The cover is made of Reprene to resist oil, hot water, abrasion and sunlight. The tube is reinforced by three braids of high-quality, high-tensile cord to withstand a bursting pressure of 1,000 lb. per sq. in. The angle of braid is accurately controlled to give the maximum pressure resistance and each plate is separately insulated and protected from chafing by highly adhesive Reprene sheets. The hose is built on a mandrel for uniformity and to eliminate service shrinkage.

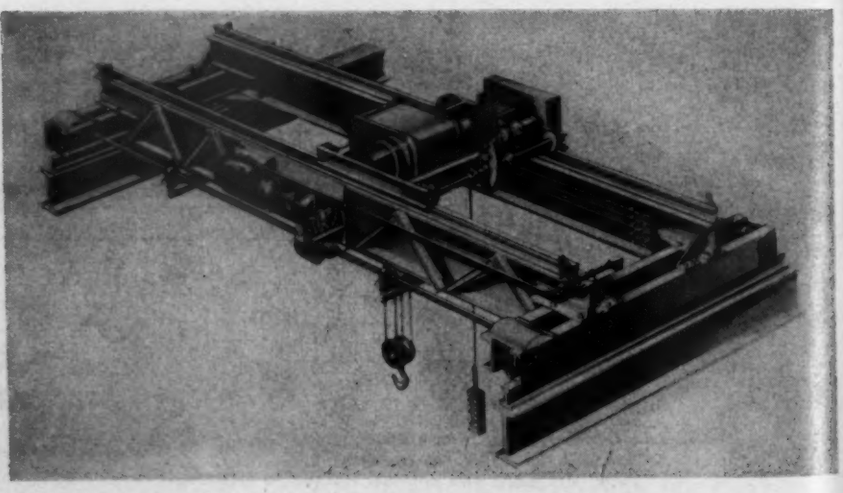
In a test installation, being used 24 hours a day at pressure up to 200 lb. as a carrier of hot oil and water to clean steam locomotives, the new hose has already been in service more than six months. Sixty days' service was considered good for any hose previously used.

Hoist-type Cranes

The Whiting Corporation, Harvey, Illinois, has announced a line of cranes known as E-type Cranes, which will be available at substantially lower initial cost than has obtained in the past. The lower cost is made possible by an engineering design which makes use of stock parts and other components which can be built in quantity and assembled without individual engineering.

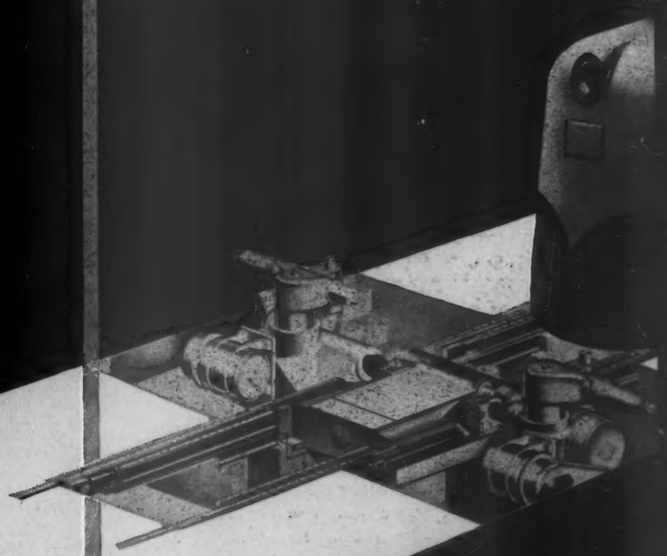
E-type cranes are built in capacities ranging up to 12 tons, and spans from 20 to 60 feet. They are designed for intermittent duty, and are usually operated from the floor by means of a pendant push-button control station. A bridge or trolley, or both, may be supplied without motors for handpower operation, if desired, or the crane may be supplied with cab control.

The E-type cranes embody fluid drive and magnetic control. The design permits higher lift of the hoist by keeping down headroom requirements, and features a rigid bridge and streamlined design to eliminate useless weight.



Whitney E-type Crane

ANNOUNCING THE AVAILABILITY OF THE *Standard* WHEEL TRUING MACHINE



AFTER MANY YEARS of development the *Standard* Wheel Truing Machine has changed a need to a reality.

The railroad using this machine during the past year has saved many thousands of dollars. Hundreds of railroad men have seen it in operation and have been waiting for this announcement: *The Standard Wheel Truing Machine is now available.*

Today it is obsolete to remove wheels to restore their contour.

Standard
RAILWAY EQUIPMENT MANUFACTURING COMPANY

The World's Largest Fabricators of Railway Car Specialties
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NEWS

H. B. Oatley, Doctor of Engineering

HENRY B. OATLEY, retired vice-president of the Superheater Company, division of Combustion Engineering-Superheater, Inc., was awarded the honorary degree of doctor of engineering at the 1950 commencement exercises of the University of Vermont on June 12. Mr. Oatley is still a consultant on the engineering staff of the Superheater Company.

National Exposition of Power and Mechanical Engineering

The nineteenth National Exposition of Power and Mechanical Engineering will be held in the Grand Central Palace, New York, November 27 to December 2, in connection with the annual meeting of the American Society of Mechanical Engineers, under whose auspices the exposition will be held for the first time. Charles F. Roth, president of the International Exposition Company, is manager of the exposition, information concerning which can be secured at Grand Central Palace, New York 17.

Derailed by Broken Wheel—Cracks Originated in Stencils

FAILURE of a carbon-steel locomotive wheel, which broke as a result of cracks originating in stencil marks, caused the April 20 derailment of a Union Pacific freight train near Walnut, Calif., according to a report of the Interstate Commerce Commission. The report was made by Commissioner Patterson, based on an investigation conducted by the commission's Bureau of Locomotive Inspection.

The involved wheel was under the third unit of a four-unit Diesel-electric locomotive which was hauling a 4,845-ton, westbound train of 77 loaded cars at a tape-recorded speed of 59 m.p.h., 9 m.p.h. in excess of the 50 m.p.h. limit for freight trains in the territory. The Diesel unit was designed for a maximum speed of 65 m.p.h.

The accident, which occurred on a tangent stretch of track at Fallon Spur, 2.1 mi. west of Walnut, resulted in derailment of the affected pair of wheels under the Diesel unit and 41 cars of the train. Two trespassers who were riding in one of the derailed cars were killed.

The Diesel unit on which the wheel broke was 1614-C, designed to be used as a trailing or intermediate unit. The wheel which failed was the left rear wheel with respect to the direction of movement.

Damage to unit 1614-C, in addition to the broken wheel, was minor. The other locomotive units were not damaged and no slid spots were found on any wheels except the mate to the broken wheel.

Unit 1614-C was of the B-B type, built by the American Locomotive Company in December, 1947. Its 4-wheel equalizer trucks had a General Electric Company type 752 traction motor driving each pair of wheels, which were 40 in. in diameter when new. The weight of the unit was 235,200 lb., its gear ratio was 74 to 18, and it was equipped with a dynamic brake, with type 24RL brake equipment.

The wheel which failed was a Class BR, heat-treated, rolled-steel wheel, 40 in. in diameter and having a rim thickness of 2½ in. when new. It came to the U. P. under a Diesel unit built in August, 1948, and it had been turned twice to remove

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of March 1950	Month of March 1949	Three months ended with March 1950	Three months ended with March 1949
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	29,197	35,312	78,496	108,643
3-06	Total, Diesel-electric	17,000	11,939	46,897	32,961
3-07	Total, electric	891	803	2,335	2,528
3-04	Total, locomotive-miles	47,097	48,054	127,738	144,133
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,599	1,507	4,217	4,415
4-06	Empty, total	830	856	2,285	2,520
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	48,538	52,330	119,632	165,551
6-02	Total in oil-burning steam locomotive trains	11,803	15,737	32,803	45,045
6-03	Total in Diesel-electric locomotive trains	48,118	34,605	130,919	93,549
6-04	Total in electric locomotive trains	2,311	2,216	5,956	6,682
6-06	Total in all trains	110,799	104,896	289,352	310,844
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.05	1.05	1.05	1.06
10-02	Loaded freight car-miles	38.20	35.20	36.80	34.60
10-03	Empty freight car-miles	19.80	20.00	20.00	19.70
10-04	Total freight car-miles (excluding caboose)	58.00	55.20	56.80	54.30
10-05	Gross ton-mies (excluding locomotive and tender)	2,648	2,450	2,527	2,435
10-06	Net ton-miles	1,217	1,091	1,128	1,107
12	Net ton-miles per loaded car-mile (M-211)	31.90	31.00	30.60	32.00
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	65.80	63.80	64.90	63.70
14	Averages per train hour (M-211):				
14-01	Train miles	16.60	17.10	17.00	16.70
14-02	Gross ton-miles (excluding locomotive and tender)	43,296	41,357	42,304	40,214
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	44.30	41.10	40.70	41.50
14-02	All	41.10	39.10	37.70	39.50
15	Average net ton-miles per freight car-day (000) (M-240)	863	772	749	806
17	Per cent of home cars of total freight cars on the line (M-240)	43.60	52.10	48.80	49.10

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	11,241	17,342	32,592	52,348
3-06	Diesel-electric	14,538	12,061	41,649	34,289
3-07	Electric	1,647	1,725	4,755	5,128
3-04	Total	27,426	31,151	78,996	91,825
4	Passenger-train car-miles:				
4-08	Total in all locomotive-propelled trains	264,851	285,415	765,490	843,228
4-09	Total in coal-burning steam locomotive trains	57,681	91,636	162,314	281,071
4-10	Total in oil-burning steam locomotive trains	34,687	44,584	104,796	131,971
4-11	Total in Diesel-electric locomotive trains	154,407	130,166	446,222	373,656
12	Total car-miles per train-miles	9.39	8.96	9.43	9.04

YARD SERVICE (DATA FROM I.C.C. M-215)

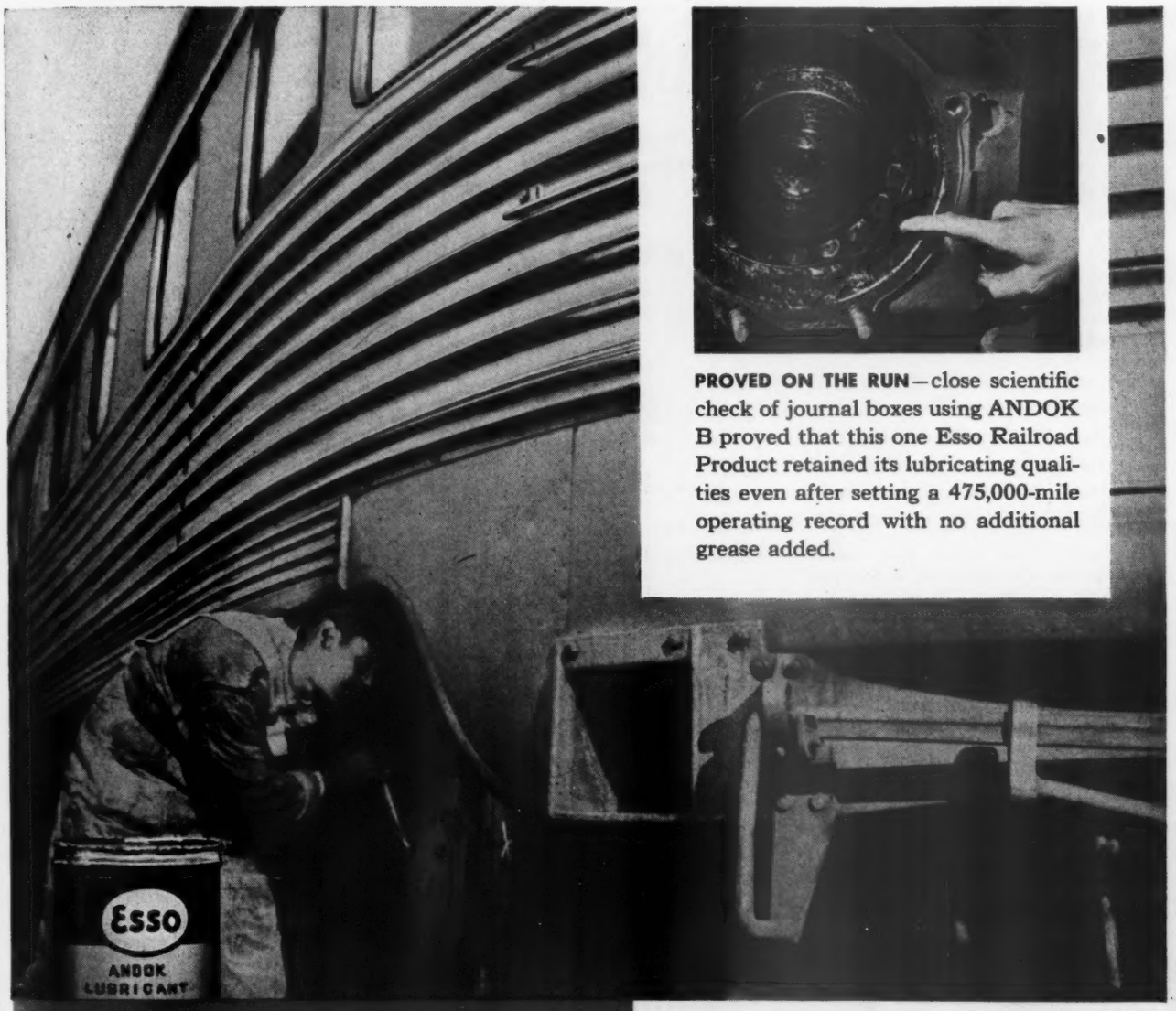
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,476	1,987	4,086	6,222
1-02	Steam, oil-burning	231	312	667	919
1-03	Diesel-electric[1]	2,418	1,947	6,812	5,567
1-06	Total	4,153	4,274	11,643	12,789
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	63	104	190	323
2-02	Steam, oil-burning	14	18	40	53
2-03	Diesel-electric[1]	226	204	660	591
2-06	Total	338	361	992	1,071
3	Hours per yard locomotive-day:				
3-01	Steam	7.70	8.60	7.30	9.10
3-02	Diesel-electric	17.60	17.90	17.30	17.80
3-05	Serviceable	14.20	13.30	13.70	13.60
3-06	All locomotives (serviceable, unserviceable and stored)	11.60	11.40	11.20	11.70
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.80	1.95	1.90	2.00
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.79	0.79	0.80	0.79

[1] Excludes B and trailing A units.

Mile after mile

ANDOK LUBRICANTS—made especially for railroad use and triple-proved for trouble-free bearing lubrication in Diesel locomotives and passenger cars under millions of miles of tough railroad operating conditions.

PROVED ON THE RUN—close scientific check of journal boxes using ANDOK B proved that this one Esso Railroad Product retained its lubricating qualities even after setting a 475,000-mile operating record with no additional grease added.



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a flat spot and flange wear when it was applied to unit 1614-C on September 27, 1949. At that time the rim thickness was 2 in. and the wheel and its mate were examined by the magnaflux process. On January 10, 1950, the unit was in the shop at Los Angeles, Calif., and the pair of wheels were given rolling inspection while the truck was out. They were found to have 1/16-in. tread wear.

On the rim of the wheel these data were hot stenciled: "6-47 BETHLEHEM 6715 56T211 BR AAR NW ST." The word "BETHLEHEM" was in letters 9/16 in. high and the numerals and other letters were 3/4 in. high, all approximately 1/8 in. deep. Laboratory examination and tests of the failed parts by the U. P. and other evidence led the commission to conclude that the primary fracture developed in the stem of the letter "T" which was the final character stamped on the wheel rim.

"Two secondary fractures [the report continued] occurred through the rim; one through the figure '1' of the serial number and the other through the figure '1' of the heat number where progressive fractures 3/8 in. deep and 1 3/16 in. wide and 7/16 in. deep and 1 3/16 in. wide, respectively, were found. Cracks from 1/8 in. to 1 1/8 in. in length were also found in 13 other stenciled characters. No cracks were found from the letters of the 'Bethlehem.'"

The mate wheel which bore similar stampings was also examined. A flat spot, 7 in. long and about 1 1/2 in. from the rim, "indicated that this wheel had slid after the left wheel failed," the report said. It added that there were also skid marks entirely around the rim and cuts in the tread, "apparently made by skidding on the rail."

When this mate wheel was placed in the wheel press "in the usual manner" for removing wheels from axles and a pressure of 85 tons exerted, "the wheel cracked entirely through the rim and its wheel seat and for about 22 in. around the plate." The report from the U. P. laboratory, which was quoted by the commission, said that five cracks were noted in the stencil marks of this wheel.

As to the wheel which broke, the U. P. report said its failure was "due primarily to excessive overheating which imposed severe internal stresses upon the rim in addition to service stresses, these concentrating in large, deep stencil marks which served as stress raisers, producing initial cracks from which fractures developed." In the "discussion" section of its report the commission made these observations:

"Many of the cracks shown were discovered after the wheel parts had been prepared for laboratory examination and might not be noticed at a usual shop or terminal inspection. It is significant that the cracks in the primary and secondary fractures exhibited structure characteristics of a typical progressive fatigue failure. It is also significant that all cracks found were radial and were located in radial branches of the stencil marks or in a radial direction in the curved parts of the marks.

"The stresses in power wheels of Diesel-electric locomotive units employed in high-

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JULY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	No. of units	Horsepower	Service	Builder
Chesapeake & Ohio	18	1,600	Switching	Baldwin Loco. Wks.
Lehigh Valley	6[1]	1,600A	Freight	Alco-G.E.
	2[1]	1,600B	Freight	Alco-G.E.
	4[1]	1,600	Switching	Alco-G.E.
	4[1]	1,200	Switching	Alco-G.E.
	14[1]	1,200	Switching	Baldwin Loco. Wks.
	4[1]	1,500A	Freight	Electro-Motive
	2[1]	1,500B	Freight	Electro-Motive
	2[1]	660	Switching	Electro-Motive
New York Central	14[2]	1,500	Road switch	Electro-Motive
	7[2]	1,200	Yard switch	Electro-Motive
Seaboard Air Line	19[3]	1,600	Freight	Alco-G.E.
	4[3]	1,600	General	Alco-G.E.
	15[3]	1,500	Freight	Electro-Motive
	8[3]	1,500	General	Electro-Motive
	14[3]	1,000	Switching	Baldwin Loco. Wks.

STEAM LOCOMOTIVE ORDERS

Road	No. of locos.	Type	Builder
Norfolk & Western	15[4]	0-8-0, Class S-1	Company shops

FREIGHT-CAR ORDERS

Road	No. of cars	Type	Builder
Ann Arbor	75[5]	70-ton covered hoppers	Pullman-Standard
Canadian National	3	60-ft. flat	American Car & Fdry.
	28	50-ton air-dump	Eastern Car Co.
Gulf, Mobile & Ohio	200[6]	50-ton auto	American Car & Fdry.
Missouri Pacific	200[7]	70-ton hopper	Company shops
Norfolk & Western	1,000[4]	70-ton hopper	Company shops
St. Louis-San Francisco	95[8]	70-ton covered hopper	Pullman-Standard
Seaboard Air Line	200[9]	70-ton phosphate	Pullman-Standard
Southern	250[10]	70-ton covered hopper	Pullman-Standard
Spokane, Portland & Seattle	12	Caboose	Nor. Pac. Shops
Virginian	500[11]	55-ton hopper	Company shops
Warren Maritime Corp.	200[12]	11,000-gal. tank	American Car & Fdry.

FREIGHT-CAR LEASES

Boston & Maine	10[13]	50-ton D-F box	General-American-Evans

FREIGHT-CAR INQUIRIES

Boston & Maine	750	50-ton box
Chesapeake & Ohio	1,000	50-ton box
	1,000	70-ton hopper
New York Central	1,500	70-ton gondola
	1,500	55-ton hopper
	1,000	55-ton box
	500	55-ton box

PASSENGER-CAR ORDERS

Road	No. of cars	Type	Builder
Western Pacific	1[14]	Rail Diesel	Budd Co.

[1] Deliveries expected to be completed by the end of this year. "With the receipt of these new engines," C. A. Major, L. V. president, said, "the Lehigh Valley will have completed its Diesel program for main-line yard and road operations. All road service, freight and passenger, will be entirely Dieselized, except for one branch. All main-line yards will be completely Dieselized."

[2] The units will be placed in service on the Peoria & Eastern which will be completely Dieselized when deliveries, scheduled for before the end of 1950, are completed.

[3] Deliveries are scheduled for the latter part of 1950 and early 1951.

[4] Each of the new switchers will have a tractive effort of 62,900 lb., cast steel bed frames and oil lubrication of the driving journals. The tender will carry 15 tons of coal and 13,000 gal. of water. Bodies of the new hoppers will be built with copper-bearing steel plates of riveted and welded construction.

[5] For delivery during third quarter of 1950.

[6] Delivery of these cars is scheduled for the fourth quarter of 1950. The G.M. & O. also has ordered from the General Steel Castings Corporation 100 cast steel frames and ends which are being applied to trucks in the road's own shops to make 50-ton pulpwood cars.

[7] One hundred of the cars will be divided equally between the Gulf Coast Lines and the International Great Northern.

[8] For August delivery.

[9] Delivery scheduled to begin in September. Estimated cost $1,300,000.

[10] Approximate cost $1,650,000. The cars will be used on the Georgia Southern & Florida, the New Orleans & Northeastern and the Alabama Great Southern, all subsidiaries of the Southern. Deliveries are scheduled to start in the last quarter of 1950.

[11] To be built during last half of 1950. These cars, which will cost about $2,000,000, were originally ordered in 1948, but because of strikes and other reasons their building was deferred.

[12] For liquefied petroleum gases. Delivery to begin during fourth quarter of 1950.

[13] An experimental basis. The first car already has been delivered. Delivery of the other nine cars is expected shortly. They will be used first in less-than-carload service and for handling paper.

[14] For tri-weekly local service between Salt Lake City, Utah, and the San Francisco bay area via Oakland. The road's first such car, ordered in February, has gone into the Sacramento, Calif., shops for installation of additional sanitary facilities and reclining seats, subsequent to several "shakedown" runs.

NOTES:

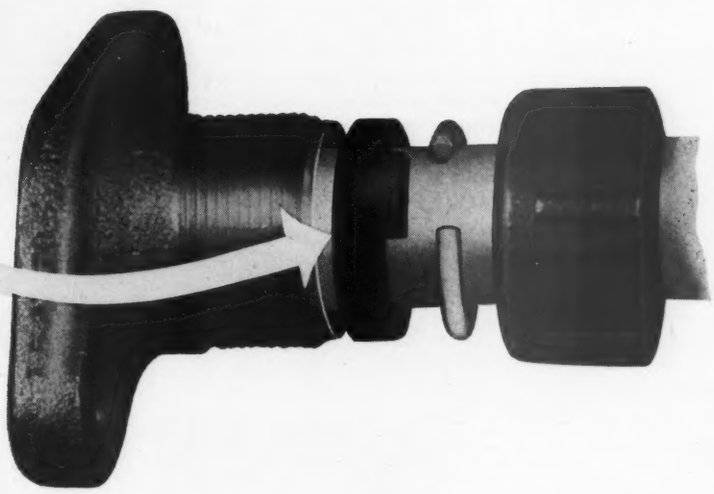
Chicago & Eastern Illinois.—The C. & E. I. has reported purchase of eight lightweight, stainless-steel coaches from surplus stock of the Chesapeake & Ohio. Each car contains a small lounge seating nine or ten passengers while the reclining seats in the body of the cars accommodate 56 or 58 passengers, depending on the individual car. The cars are being placed in service in various trains following inspection and touch-up work in the C. & E. I.'s Danville, Ill., shops.

STOP AIR LEAKAGE

at flanged pipe unions in airbrake equipment with

G-B FLEXTITE SPLIT SEALING GASKETS*

*Pat. Pend.



The A.A.R. has recognized the seriousness of brake pipe leakage due to cracks and breaks in threaded pipe connections inside flanged unions, and has included in the Code of Rules for Interchange Traffic, special fittings to correct this condition. (See Rule 101, Item 100, showing billing price; also Rule 111, Item 3, showing labor for "R and R"). NOW—no special fittings are required to correct this condition. Simply apply Flextite Split Sealing Gaskets in the conventional flanged unions without removing the pipe. *Write today for complete information.*

REDUCES AIRBRAKE PIPE LEAKAGE • REDUCES TRAIN DELA

EASY AND QUICK TO INSTALL • ECONOMICAL

G-B MFG.CO

ESTABLISHED 1898

GUSTIN-BACON MANUFACTURING CO

OVER 50 YEARS OF SERVICE TO THE TRANSPORTATION INDUSTI

KANSAS CITY, MO.

NEW YORK • CHICAGO • PHILADELPHIA • LOS ANGELES • SAN FRANCISCO • HOUSTON • TULSA • FORT WO

speed heavy-duty service are not susceptible to easy analysis and accurate determination. These stresses result from a combination of (a) locked stresses resulting from heat treatment, (b) heavy loading, (c) tractive load, (d) vibratory stress, possibly of a harmonic character, (e) shock stresses resulting from track curvature and irregularity, (f) brake and thermal stresses, and (g) flywheel effect and possibly other factors not presently recognized."

MISCELLANEOUS PUBLICATIONS

EFFECT OF BRAKE-SHOE ACTION ON THERMAL CRACKING AND ON FAILURE OF WROUGHT-STEEL RAILWAY CAR WHEELS. Bulletin issued by the University of Illinois, Engineering Experiment Station, Urbana, Ill. Price, 60 cents. Series No. 387. 104 6-in. by 9-in. pages, bound in paper. A report of progress made to date on investigation of steel car wheels being conducted by the University of Illinois, Engineering Experiment Station, in cooperation with the Technical Board of the Wrought Steel Wheel Industry. On some phases investigation has been concluded; others require additional work. Laboratory tests made on 369 wrought-steel railway car wheels. Two types of tests performed: (1) wheels stopped from high speed by high brake-shoe pressure, and (2) wheels tested under long-continued applications of brake shoes. Stop test intended to produce thermal cracks in wheel treads. Long-continued brake-shoe applications intended to produce fractures through rims and plates of wheels. In both types of tests conditions imposed on wheels more severe than wheels should receive in normal railway operation. Studies of effect of carbon content of wheel material, various methods of heat treatment, and changes in wheel design, together with qualitative analysis of stresses developed in wheels presented. Results of tests summarized in Chapter IX. Conclusions apply only to types of wheels tested.

AIR BRAKE LITERATURE. Air Brake Association, 80 East Jackson Boulevard, Chicago 4. Literature comprises Questions and Answers on 24-RL Equipment, at $2.50 per copy; Questions and Answers on HSC Equipment at $1.25 per copy; Questions and Answers on 6-BL Equipment; on UC Equipment with Quick Service Feature; on No. 8-ET equipment; on AB Freight Car Brake Equipment; on Maintenance of Steam-Driven Air Compressors, and on Maintenance of Freight Brake Equipment, each at 75 cents per copy. "Principles and Design of Foundation Brake Rigging" is available at $2.50; "Operating Instructions on 24-RL Equipment" at $1.25 per copy; "Electro-Pneumatic Brakes" at 50 cents per copy, and copies of convention proceedings for 1915, 1920, 1924, 1930 and 1937, and 1947 at $1.00 each.

SUPPLY TRADE NOTES

GENERAL ELECTRIC COMPANY.—*Horace Zimmer,* New York district manager for the General Electric Company's Appartus Department, has been appointed manager of districts for the department, with headquarters in Schenectady, N. Y. *Frank A. Faron* succeeds Mr. Zimmer as New York district manager, with headquarters at 570 Lexington avenue, New York. *Francis E. Fairman* has been appointed to the newly created position of general sales manager of Large Apparatus Divisions, with headquarters at Schenectady, and *Arthur W. Bartling* has been appointed to the newly created position of general sales manager of Small Apparatus Divisions, with headquarters at Lynn, Mass. *H. W. Goulthorpe* has been appointed manager of Transportation Divisions in Schenectady, and *J. H. Gauss* has been appointed manager of sales of the Transportation Divisions.

H. Zimmer

F. A. Faron

Mr. Zimmer began his career with General Electric in 1916 as a student engineer on the test course, following graduation from Union College, Schenectady. He left the company in 1917 for military service in World War I, during which he served overseas with the 27th Division. Since 1919, Mr. Zimmer has served as assistant manager, as manager of the transportation divisions, and as manager of the industrial division in the New York district. In July, 1946, he was appointed assistant manager of the New York district, and six months later, manager. In March, 1935, he received a Charles A. Coffin Award. He is a member of the Engineers Club and the New York Railroad Club.

Mr. Faron is a graduate of Rhode Island State College (1916). Following graduation he joined the General Electric test course at Schenectady. In 1918 he was assigned special work in the direct current engineering department, and in 1923 became associated with the railway engineering department. In 1927 he was transferred to the Apparatus Department at New Haven, Conn., being placed in charge of the transportation division. In 1936 he was appointed manager of that office. He was named assistant manager of the industrial division of the New York district in 1939 and manager of the division in 1946.

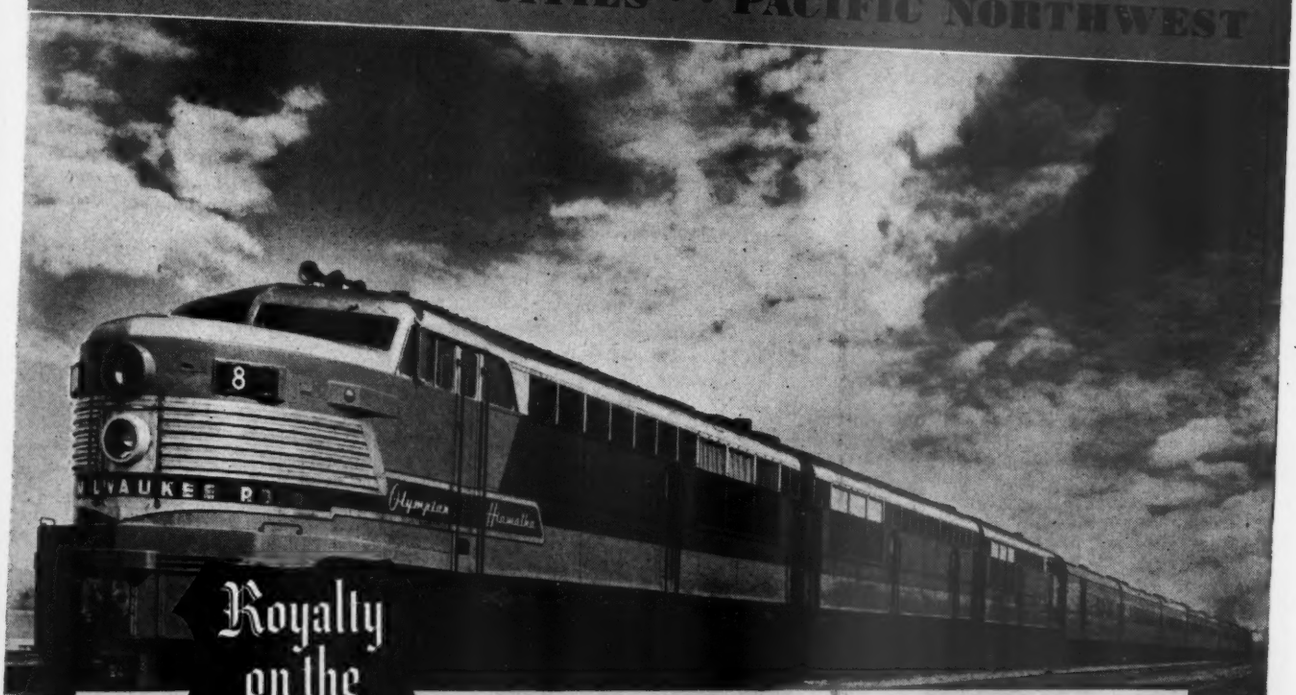
Mr. Fairman is a graduate of the U. S. Naval Academy (1921). After spending some time in the fleet, he resigned from the Navy and entered the employ of General Electric in 1923 as a requisition engineer at the Baltimore Works. He was a junior electrical engineer with the Pennsylvania Water & Power Co. for the greater part of 1925, and then returned to his former position at G. E. In 1928, he was named switchgear specialist for the Apparatus Department's Pittsburgh, Pa., of-

F. E. Fairman

THE NEWEST STREAMLINER

Olympian Hiawatha

CHICAGO • TWIN CITIES • • PACIFIC NORTHWEST

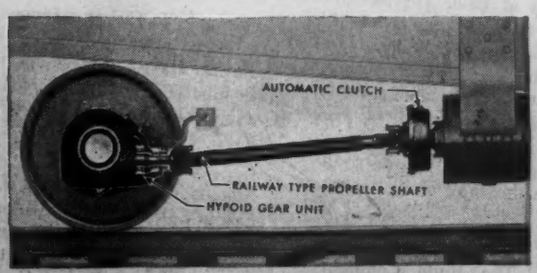


Royalty on the Rails

The "Olympian Hiawatha" . . .
Spicer Generator-Drive Equipped

From the drawing board on up, the Olympian Hiawatha represents the most advanced ideas in engineering and construction as well as in decorations and appointments. Running ice water in each car and private space, glare-free fluorescent lighting, concealed loudspeakers throughout the train for annnouncements and entertainment — these are a few of the many niceties that add to basic satisfaction in traveling on this swift and superbly smooth riding train. The Milwaukee Road chose Spicer Railway Generator Drives to fill the heavy electrical energy demands, with steady and dependable performance.

An imposing list of America's crack trains and streamliners rely upon Spicer equipment for electrical service of the highest efficiency. Write for literature giving complete details of the Spicer Railway Generator Drive.



The Spicer Railway Generator Drive is easily adaptable to old and new equipment

46 YEARS OF Spicer SERVICE

The Spicer Railway Generator Drive is manufactured, sold and serviced by

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

CHICAGO MILWAUKEE ST. PAUL AND PACIFIC

THE MILWAUKEE ROAD

fice, and two years later was appointed steel-mill specialist for that district. He was later put in charge of steel-mill sales for the Pittsburgh office, and in 1933 was transferred to the Switchgear Divisions at Philadelphia, Pa. He became sales manager of the Panel and Equipment Division in 1939, and assistant manager of the Switchgear Divisions in 1941.

From 1945 to 1949, Mr. Fairman was vice-president of the Food Machinery & Chemical Corp. and general manager of its Peerless Pump Division, with headquarters at Los Angeles, Calif. In 1949 he returned to G. E. as manager of sales for the Transformer and Allied Product Divisions at Pittsfield, Mass.

Mr. Bartling is a graduate of the University of Illinois with a B. S. degree in electrical engineering and has recently attended a post-graduate course at Harvard University's Graduate School of Business

A. W. Bartling

Administration. He joined G. E. on the test course in 1919 at the company's Fort Wayne (Ind), Works. Later that year, he entered fractional-horsepower motor sales, and in 1923 was transferred to the Chicago office as a member of the sales organization. He was named assistant manager of the fractional-horsepower motor section of the Motor Divisions when he returned to Fort Wayne in 1931, and became manager of the Fractional-Horsepower Motor Division in 1934. Under a reorganization of the Apparatus Department into separate businesses in 1947, he was appointed manager of sales of the Fractional-Horsepower Motor Divisions at Fort Wayne.

Mr. Gouldthorpe is a graduate of the University of Michigan (1927), with a degree in mechanical engineering. He joined General Electric in 1927 and in 1928 was assigned to work on the test engineering program at Erie, Pa., in March, 1936, he was appointed head of the mechanical design section of the Transportation Engineering Division, and later became executive assistant to the engineer of the same division. He spent four months during 1945 touring the European battle area on an ordnance intelligence mission for the War Department. He then became Erie Works engineer and, subsequently, manager of engineering for the Locomotive and Car Equipment Divisions.

H. W. Gouldthorpe

Mr. Gauss, a graduate of the University of Idaho with a degree in mechanical engineering, has been associated with G. E. since 1937. He began on the test engineering course and has since served in the control engineering division, the motor engineering division, the urban transit sales division, and the railroad rolling stock sales division of the Locomotive and Car

J. H. Gauss

Equipment Divisions at Erie. He was assistant manager of sales for the latter divisions prior to his new assignment. In 1941 Mr. Gauss entered military service as a first lieutenant, later becoming commander of the 701st Tank Battalion. He served in France, Belgium, Holland, and Germany, returning to inactive duty in January, 1946, with the rank of lieutenant colonel.

◆

BUDD COMPANY.—The Budd Company has announced another model of its rail Diesel car. Designated RDC-4, it is similar to Budd's three other standard-length RDC types except that it is 73 ft. 10 in. long and contains a 30-ft. railway post office and a 32-ft. baggage section instead of passenger seats. Its cost, f.o.b. Philadelphia, Pa., is $126,850. Like its counterparts, RDC-4 will be constructed of stainless steel and powered by two 275-hp. Diesel engines operating through torque converters. RDC-4 will have washrooms in both compartments and there will be a water cooler and hot plate in the post office section. Other models of the car are: RDC-1, which seats 90 passengers; RDC-2, which has a 17-ft. baggage section and seats for 71; and RDC-3, which has a 15-ft. railway post office, a 16-ft. 9-in. baggage section and seats for 49.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Roy F. Johnson*, associate director of research of Pullman-Standard Car Manufacturing Company at Hammond, Ind., has been appointed manager of the sales and service engineering division. As manager of the new division, Mr. Johnson will serve as liaison between the sales department of Pullman-Standard and the shops, production engineering and research branches of the company. The division also will carry on the customer field service heretofore conducted by the research department.

◆

WESTINGHOUSE ELECTRIC SUPPLY COMPANY.—*John F. Myers* has been elected president of the Westinghouse Electric Supply Company, New York, N. Y., to succeed David M. Salsbury, who will become vice-president in charge of Texas and Pacific coast operations of the company, with headquarters at San Francisco, Cal. Mr. Myers was formerly manager of the company's new consumer product factory branches in the Middle Atlantic district.

◆

LUNKENHEIMER COMPANY.—*Melvin W. Pauly* has been appointed New York manager of the Lunkenheimer Company.

◆

BRODERICK & BASCOM ROPE CO.—The Broderick & Bascom Rope Co. has acquired the entire stock interest of the Broderick family, and *John K. Broderick* and *Arthur L. Broderick* have retired as president and vice-president, respectively, and as directors. *Charles E. Bascom* has been elected president and *Joseph H. Bascom*, first vice-president and secretary-treasurer.

◆

CORDLEY & HAYES.—*James L. Johnson* has been appointed sales manager of Corley & Hayes. Mr. Johnson was previously district merchandise manager of the Graybar Electric Company at Jacksonville, Fla.

◆

SILENT HOIST & CRANE CO.—The *T. C. Johnson Company*, 923 Midland building, Cleveland 15, Ohio, has been appointed railroad equipment representative of the Silent Hoist & Crane Co. to succeed Charles E. Murphy, deceased.

◆

HENNESSY LUBRICATOR COMPANY.—*Robert B. Craig* has been appointed representative at Washington, D. C., for the Hennessy Lubricator Company.

◆

GENERAL MOTORS CORPORATION.—*Raymond H. Cramer* has been appointed gen-

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT R.P.M. Delo Oil R.R.

UNIT Locomotive Diesel E.M. 567

SERVICE Freight haul over mountains

PERIOD 4 years

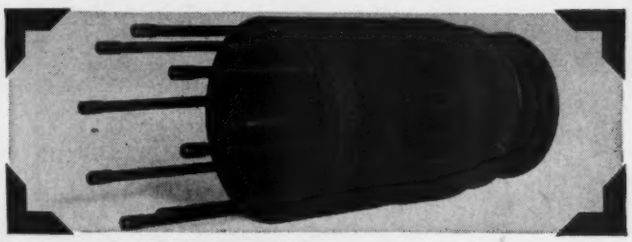
LOCATION Auburn, Wash. — Livingston, Mont.

FIRM Northern Pacific Railway

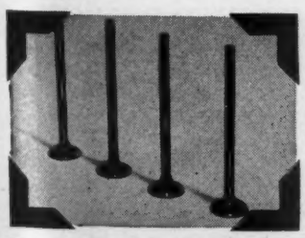
Engine parts still in use after 4 years freight service!

RPM DELO OIL R.R. IN THIS LOCOMOTIVE'S ENGINES during four years of mountain freight service, held wear down so low that after each progressive-maintenance inspection the cylinder-assembly parts were put back to work.

IN SERVICE 490,013 MILES, this piston indicates the excellent condition of all parts as they came from the engines. Note the absence of lacquer deposits and that all rings are free. A special detergent in RPM DELO R.R. keeps contaminants harmlessly dispersed in the oil.



481,384 MILES OF SERVICE from this liner during 4 years caused only 0.005" wear, 0.001" taper.



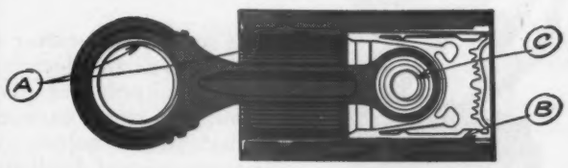
NO VALVE TROUBLE of any kind was encountered. Mileage on these valves, 200,000 since servicing cylinder head.

CON ROD BEARINGS, CARRIER AND WRISTPIN BUSHINGS at the end of four years were in "perfect" condition as this picture shows. Mileage on these parts is 481,384.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oil R. R. prevents wear, corrosion, oxidation



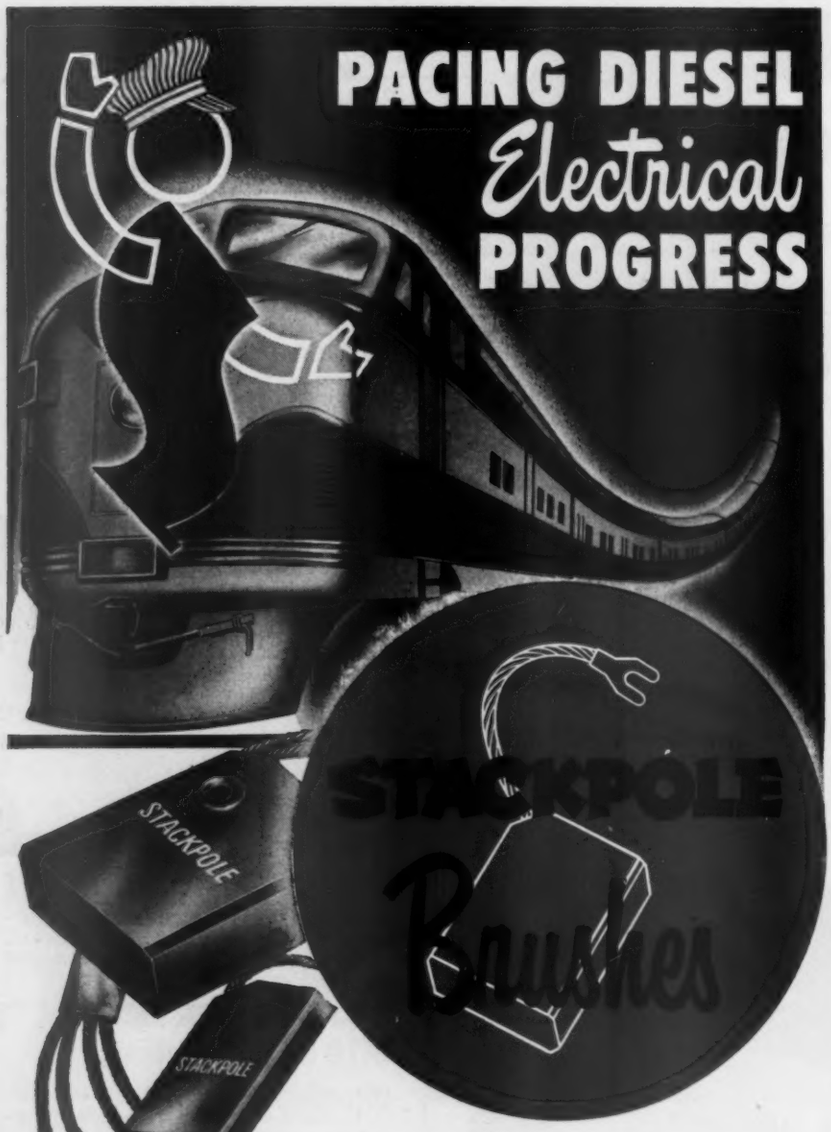
A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls and valve blows.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado



As specialists for over 40 years in brushes for all types of electrical rotating equipment, Stackpole has played a big part in developing better carbon brush grades for modern Diesel motors, generators and auxiliary equipment. Each Stackpole brush recommendation is based on actual "on the job" tests that assure top notch performance, minimum commutator maintenance and maximum brush life for your specific operating conditions.

Stackpole Diesel Brushes are sold only to makers of original Diesel equipment. Replacement brushes can be purchased through these manufacturers.

STACKPOLE CARBON CO.
ST. MARYS, PA.

RAIL BONDING MOLDS • CARBON RHEOSTAT DISCS • PUMP AND FLUID DRIVE SEALS • WELDING CARBONS • BRAZING TIPS • ELECTRONIC COMPONENTS • CONTACTS and dozens of other items.

eral manager of the *Hyatt Bearings Division* of General Motors Corporation to succeed *H. O. K. Meister*, who died June 10.

◆

CANADIAN LOCOMOTIVE COMPANY.—*Robert H. Morse, Jr.*, president of Fairbanks, Morse & Co., has been elected president and chief executive of the Canadian Locomotive Company.

◆

GENERAL STEEL CASTINGS COMPANY.—*John A. McCormick* has been appointed assistant vice-president—sales of the General Steel Castings Corporation. Mr. McCormick continues in charge of the Chicago district. *Howard F. Park, Jr.*, has been appointed district manager—sales in charge of the Eastern district sales office of the company at Eddystone, Pa., to succeed *James W. Cooke*, whose appointment as assistant vice-president was announced in the July issue.

Mr. McCormick began his business career in 1916 as a draftsman with the

John A. McCormick

Commonwealth Steel Company. For many years he served in the engineering department of General Steel Castings at Granite City, Ill., joining the sales department in 1930 at Eddystone, Pa. He was appointed district manager of sales, in charge of the Chicago office, in 1939.

Mr. Park joined the company in April,

Howard F. Park, Jr.

Have you looked at your Snubbers lately?

Old freight car trucks with faulty snubbers are rough on your *pocketbook*, too. Rejuvenate these veterans, now, and you'll be money ahead.

If you choose with care, the snubbers you buy will last as long as the cars. So, the *sooner* you make these installations, the *greater* your savings will be.

It's a matter of record that Simplex Snubbers give the *smoothest ride* it is possible to get from an AAR Coil-Snubber Grouping. *That's* the kind of performance you want.

Five simple, rugged parts—all visible for quick inspection—interlock to form a *long-lasting* unit, easily installed. Thus, convenience is combined with economy.

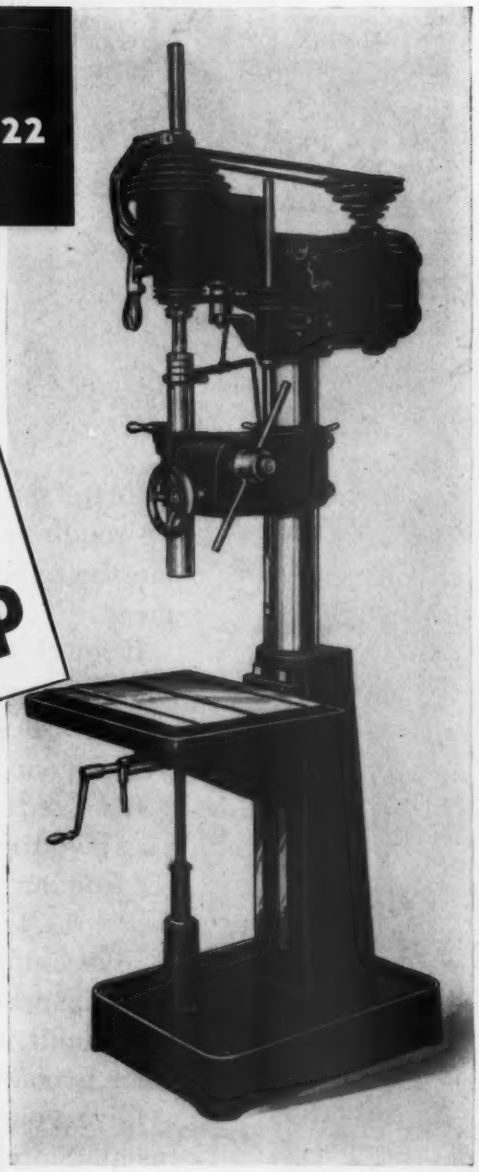
Give your old cars a *new lease on life*. Install Simplex Unit-Type Snubbers. It's an investment that not only pays for itself, but earns a *profit* for you!

SIMPLEX *unit-type* SNUBBERS

AMERICAN STEEL FOUNDRIES

"Buffalo" NO. 22 DRILL

You'll like its LOW UPKEEP



—Its Easy Handling

—Its Rugged Construction

The No. 22 Drill is the result of engineering to give you the "most drill". All controls are easily reached. Eight speeds, 65 to 1350 r.p.m., for 3/16" to 2" holes. All setup adjustments easily made, without wrenches. It's 94" high, with 5.5" column, 1.312" spindle. There's 27½" of space under spindle nose, enough for 95% of the work. You're buying "all drill without the frills" when you buy this big, accurate machine! WRITE FOR BULLETIN 2989-E.

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

174 Mortimer St. Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

1942, and was in charge of the purchasing department until November, 1945, when he became assistant to vice-president—sales. In July, 1948, he was appointed assistant district manager—sales. Mr. Park, a graduate of the Wharton School of Business and the University of Pennsylvania (1926), served with the Western Electric Company and later the Edward G. Budd Manufacturing Company (now the Budd Company) before his association with the General Steel Castings Company.

Mr. Cooke, a graduate of Princeton University (1930), entered the service of General Steel Castings in 1937. After sev-

James W. Cooke

eral years in the production and service departments he became sales representative for the New England district. He was appointed district manager—sales, in charge of the eastern district sales office in July, 1947.

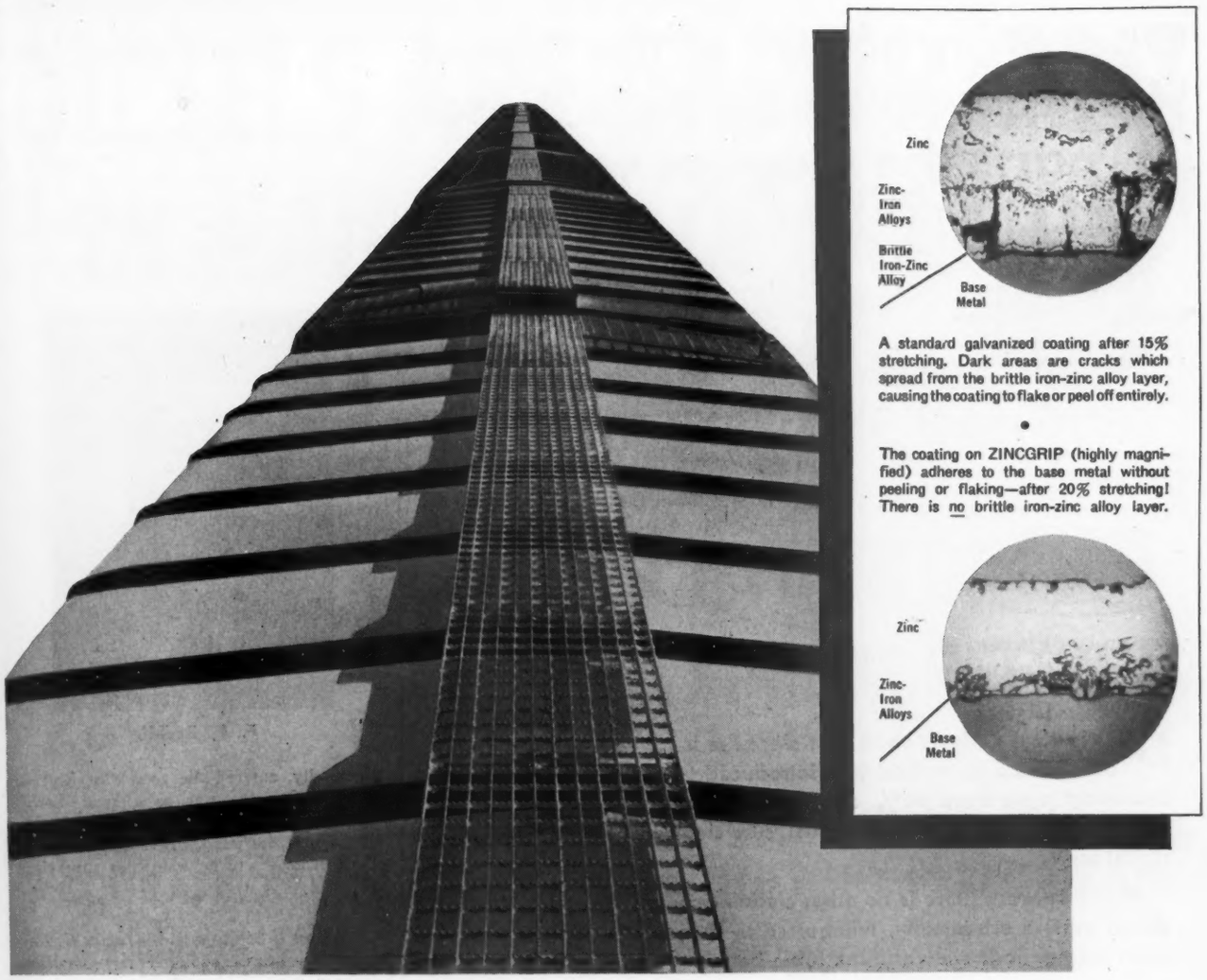
◆

COPPERWELD STEEL COMPANY.—*E. G. Elg*, western sales manager of the Copperweld Steel Company, has been appointed to fill the newly created position of manager of railroad sales. Mr. Elg becomes a part of the general sales staff of the com-

E. G. Elg

pany which has general offices at Glassport, Pa., but he will continue to maintain his headquarters at Chicago.

Mr. Elg entered the service of Copperweld 28 years ago, after completion of his technical training at the engineering school


Zinc
Zinc-Iron Alloys
Brittle Iron-Zinc Alloy
Base Metal
A standard galvanized coating after 15% stretching. Dark areas are cracks which spread from the brittle iron-zinc alloy layer, causing the coating to flake or peel off entirely.
The coating on ZINCGRIP (highly magnified) adheres to the base metal without peeling or flaking—after 20% stretching! There is no brittle iron-zinc alloy layer.
Zinc
Zinc-Iron Alloys
Base Metal

Save on the long pull with this special-purpose steel

With freight traffic levels high, and maintenance costs at an all-time peak, you'll want to consider long-lasting Armco ZINCGRIP-PAINTGRIP for freight car roofs, doors and other exposed car parts.

The zinc coating on ZINCGRIP-PAINTGRIP is the same special coating used on Armco ZINCGRIP, which has *15 to 45% greater resistance to atmospheric corrosion than equal-weight coatings on regular galvanized sheets.*

Besides this more durable zinc coating underneath, you have the added advantage of a mill-applied Bonderized finish that takes and preserves paint. Field tests show that paints last several times longer than on ordinary galvanized sheets.

These features help insure longer service, a minimum of shopping time, fewer repairs and replacements.

In the car shops, Armco ZINCGRIP-PAINTGRIP takes severe drawing and forming without damage to the zinc coating. This means *unbroken* zinc protection for sharply formed sections as well as flat parts. And ZINCGRIP-PAINTGRIP can be painted immediately, without chemical etching or priming.

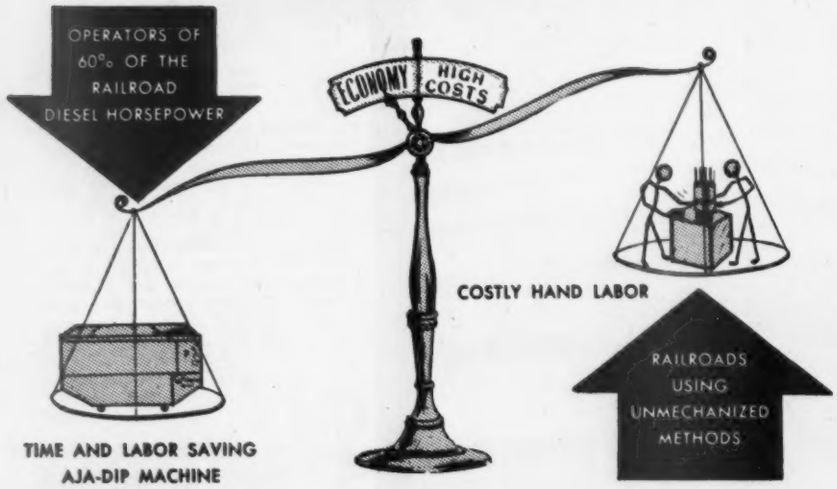
Ask us to send you complete data on the properties and applications of this special-purpose steel.

ARMCO STEEL CORPORATION

100 CURTIS STREET, MIDDLETOWN, OHIO, WITH PLANTS AND SALES OFFICES FROM COAST TO COAST • THE ARMCO INTERNATIONAL CORPORATION, WORLD-WIDE

ARMCO

Operators of 60% of the Diesel Horsepower clean their diesel parts the Magnus way!


OPERATORS OF 60% OF THE RAILROAD DIESEL HORSEPOWER
ECONOMY
HIGH COSTS
COSTLY HAND LABOR
RAILROADS USING UNMECHANIZED METHODS
TIME AND LABOR SAVING AJA-DIP MACHINE

DURING the relatively short time since the Magnus Aja-Dip diesel parts cleaning method was introduced to the railroads, roads operating more than 60% of the total diesel horsepower have adopted the Magnus method for fast, sure cleaning of disassembled diesel parts.

WHY? Because there is no other cleaning method that will clean diesel parts mechanically, *without costly hand labor*, in the very short time periods shown in the table below.

DIESEL PARTS	MAGNUS CLEANING TIME
Heads	1½ hours
Liners	2 hours
Rods	20 minutes
Pistons	20 minutes
Blowers	20 minutes
Valves	15 minutes
Strainers	10 minutes
Miscellaneous parts	5 to 15 minutes

Can you afford to be without such time and labor savings in your growing diesel operations? Let us show you how other diesel users are economizing with the Magnus Diesel Parts Cleaning Method. Write for complete information today.

Railroad Division

MAGNUS CHEMICAL COMPANY • **77 South Ave., Garwood, N. J.**

In Canada—Magnus Chemicals, Ltd., Montreal

Magnus CLEANERS AND CLEANING EQUIPMENT

Representatives in all principal cities

of the University of Illinois, and three years of railroad and utility experience.

◆

EUTECTIC WELDING ALLOYS CORPORATION.—*F. F. Roehll* has been appointed national sales manager of the Eutectic Welding Alloys Corporation, New York. *Don Rasmussen* has been appointed western sales supervisor.

Mr. Roehll, a graduate of the Ohio State

F. F. Roehll

University, entered the service of Eutectic shortly after the war as a local district engineer in California. After several years in the west, he was transferred to the New York office where he was sales supervisor.

◆

LAMSON & SESSIONS CO.—*James G. Rayburn* has been appointed merchandising director and *William E. Custar* assistant sales manager of the Lamson & Sessions Co. Mr. Rayburn joined Lamson in October, 1945, and since that time has served

William E. Custar

as assistant to A. U. Klingman, railroad sales manager, and later as sales assistant in the general offices at Cleveland, Ohio. In addition to his new duties Mr. Rayburn will retain control of a number of diversified sales functions.

◆

UNITED STATES STEEL SUPPLY CORPORATION.—*Paul C. Van Cleave* has been elected sales vice-president of the United States

DIESELS ARE IMPORTANT
IN RAILROAD OPERATION

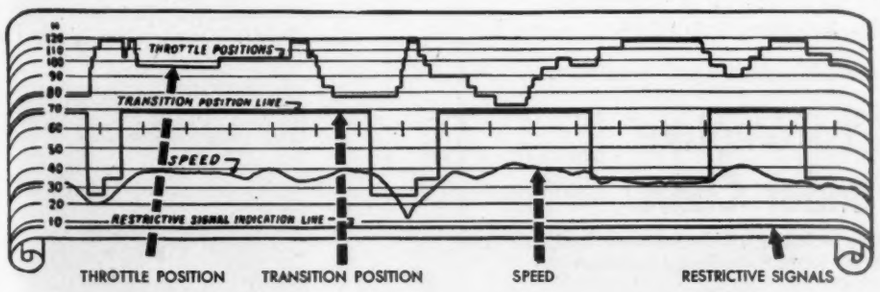
SO ARE RECORDS OF WHAT THESE DIESELS ARE DOING AND HOW THEY ARE HANDLED

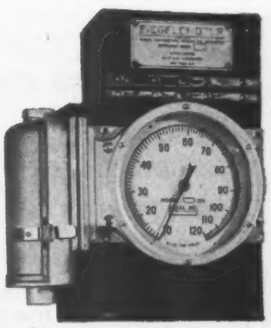
BARCO RECORDERS

PROTECT YOUR DIESELS GET MAXIMUM RETURNS

BARCO RECORDERS GIVE YOU A COMPLETE, ACCURATE RECORD OF OPERATION AND PERFORMANCE

- *Speed*
- *Time*
- *Mileage*
- *Location*
- *Throttle Position*
- *Reverse Lever Position*
- *Manual Transition*
- *Dynamic Braking*
- *Overspeed*
- *Forestalling for Automatic Train Stops*
- *Slippage*





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BARCO MANUFACTURING CO.

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A Practical Evaluation of

Railroad Motive Power

By P. W. KIEFER

Chief Engineer, Motive Power and Rolling Stock, New York Central System

The first authoritative information in book form of the comparative advantages of standard types of railroad motive power—steam, Diesel-electric, and electric. Based upon the results of a study made by the New York Central System of comparative operating costs of all three types on main line divisions.

Contents

Foreword—Introduction—The Reciprocating-Type Steam Locomotive—Other Coal-Fired Steam Locomotives—The Gas-Turbine Locomotive — Electric Locomotives — Diesel-Electric Locomotives — Motive Power Potentialities—Conclusions.

1949. 66 pages, illus., tables, charts, 5½x8¾, cloth, $2.50.

★

The Steam Locomotive

By RALPH P. JOHNSON

Chief Engineer, The Baldwin Locomotive Works

An authoritative treatise on the theory, operation and economics of the steam locomotive which includes comparisons with Diesel-electric locomotives. The subject matter is stripped down to fundamentals. Enough background is included to indicate paths of development.

1944. 2nd. 550 pages, 90 illus., 75 tables, 6x9, $5.00.

★

Shop Hints on

Locomotive Valve Setting

By JACK BRITTON

In natural sequence and with the aid of simple drawings, without puzzling mathematical formula, the author, a former apprentice instructor, shows how to follow through on most any valve setting job. Covers Stephenson link motion, Walschaert, Baker, Young, and Joy valve gears, and the Gresley lever arrangement. Takes the mystery out of valve setting.

2nd. 350 pages, 210 illus., 5x8, $3.00.

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4-6-4 Locomotive and Tender Chart

Shows 315 numbered parts including all the latest equipment on a Hudson type passenger locomotive. Scaled elevation and four cross-sectional drawings.

40x30 inches, folded to 9½x12, $.50

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30 Church Street, New York 7, N. Y.

Please send me on Ten Days' Free Examination the book(s) and/chart checked below. If not satisfactory I will mail them back postpaid. Otherwise I will remit their list price.

☐ Railroad Motive Power, $2.50 ☐ Steam Locomotive, $5
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RMG-EE 8-50

Steel Supply Company (U. S. Steel Corporation subsidiary). Elected sales vice-president of the Columbia Steel Company, another U. S. Steel subsidiary.

Mr. Van Cleave is a graduate of the University of Colorado School of Business Administration. He started his career in the steel business in 1934 with the Colorado Fuel & Iron Co. as a sales representative. In May, 1942, he entered the U. S. Army Air Forces as a bombardment crew training staff officer. Upon his discharge in October, 1945, he returned to Colorado Fuel as manager of sales—structural and bars. He joined the U. S. Steel Supply

Paul C. Van Cleave

Company in March, 1947, as assistant to vice-president at Chicago, and was transferred to Los Angeles, Calif., in June, 1947, as assistant district manager. In January, 1949, he became Los Angeles district manager.

◆

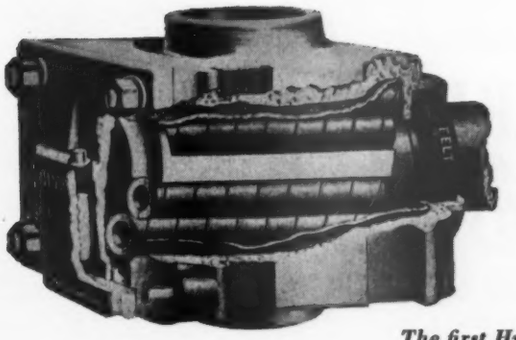
COLUMBIA STEEL COMPANY.—*Marcus J. Aurelius*, sales vice-president of the United States Steel Supply Company (a U. S. Steel Corporation subsidiary), has been elected sales vice-president of the Colum-

Marcus J. Aurelius

bia Steel Company (also a U. S. Steel subsidiary).

Mr. Aurelius started his sales career in the steel industry in 1931 when he joined Colorado Fuel & Iron after graduation

"FREE LATERAL"



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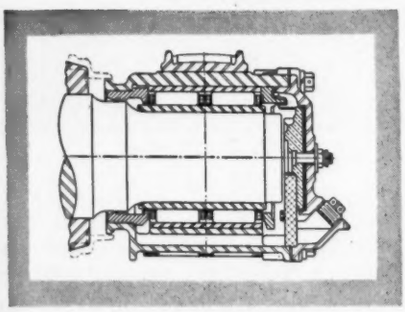
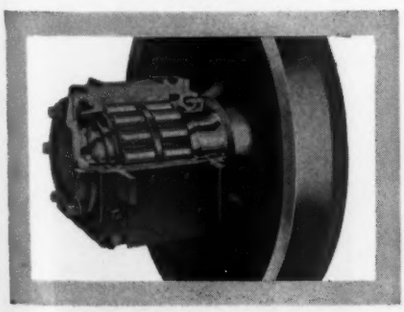
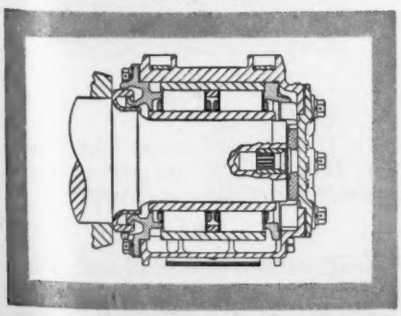


TYPE D



TYPE JM



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Free lateral was not "discovered" by Hyatt, but was first embodied by Hyatt in roller bearing journal box designs for application to railway passenger carrying cars.

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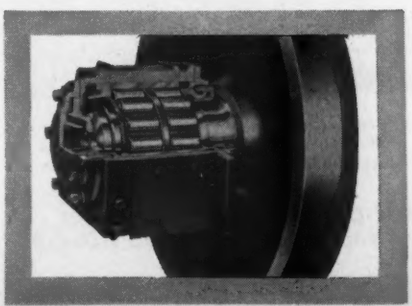
So, free lateral has *always* been an extra premium you gained over the years, by using Hyatt Railroad Journal Boxes... we hope, for this reason, you will always specify them for your head end, and passenger carrying cars. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



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These are the latest designs of Hyatt Journal Boxes.

HYATT ROLLER BEARING JOURNAL BOXES

FOR QUICK—ECONOMICAL

RERAILING of LOCOMOTIVES and RAILROAD CARS

DUFF-NORTON *TRAVERSING BASES*

Emergency rerailing of Diesel, steam, electric locomotives and railroad cars . . . is safe, simple and low in cost, with Duff-Norton Traversing Bases. Carried on wreck trains in units of two bases and two jacks, they eliminate the need for expensive cranes and are always available for any rerailing job.

Traversing Bases and Jacks are placed under load, for rerailing locomotives and cars.

QUICK DATA ON TRAVERSING BASES

Jack No.	Capacity Tons	Height Inches	Horizontal Travel Inches	Weight Pounds	Size of Plate Inches
39-TB	35	3¾	15	85	12 dia.
*40-TB	50	4	15	106	10 x 12
41-TB	50-75	4	20	140	14 dia.

*No. 40-TB can also be furnished for 26" horizontal movement on special order.

No. 40-TB furnished with wooden operating lever 1⅛" x 24" long.

Nos. 39-TB and 41-TB supplied with steel operating lever 1" x 24" long.

Freight car is lifted and moved horizontally until wheels are aligned with rails. Jacks are lowered to complete rerailing job.

For Jacks Used With Traversing Bases . . . Write for Your Copy of Bulletin AD-4-R.

DUFF-NORTON JACKS

THE DUFF-NORTON MANUFACTURING CO.

Main Plant and General Offices, PITTSBURGH 30, PA. Canadian Plant, TORONTO 6, ONT.

"The House that Jacks Built"

from the University of Denver. He went with U. S. Steel in 1937 as a salesman of railroad materials and commercial forgings for the Carnegie-Illinois Steel Corporation, a subsidiary of U. S. Steel. He later became a sales engineer and assistant manager of sales in that division. In August, 1946, he becaume vice-president of sales for U. S. Steel Supply Company.

◆

TURCO PRODUCTS, INC.—*J. D. Charters*, district sales manager of Turco's, Houston,

J. D. Charters

Tex., Division, has been transferred to the northern California sales district, with headquarters in San Francisco, Calif. He succeeds *Al Martinez* who died early in

C. Williams

June. *C. Williams*, assistant district manager in Houston for the past six years, succeeds Mr. Charter at Houston.

◆

SPICER MANUFACTURING DIVISION, DANA CORPORATION.—*Walter I. Buchanan* has been appointed sales manager of the service parts division of the Spicer Manufacturing division of the Dana Corporation, succeeding *David F. Kalish*, who will continue with the company on field sales assignments.

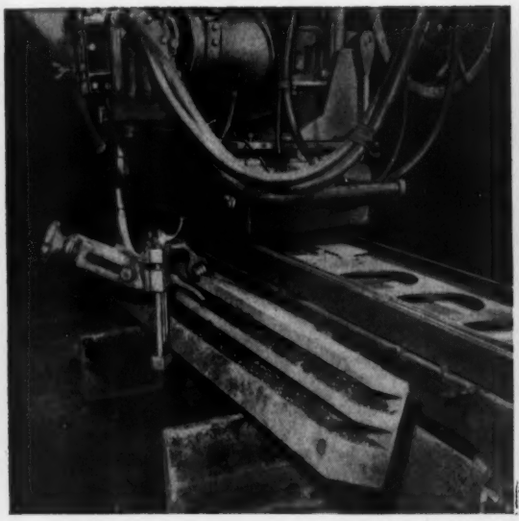
Mr. Buchanan is a graduate of the University of Illinois, 1930, with a degree in mechanical engineering. He joined the

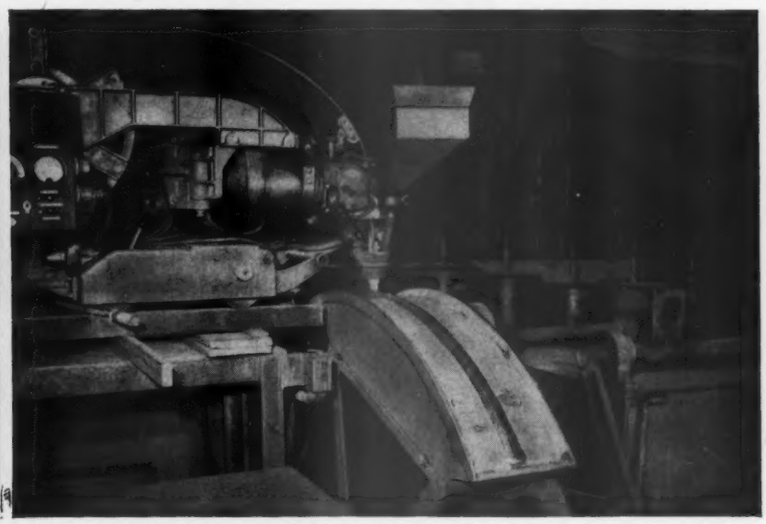
Having Trouble Getting New Parts?

. . . Rebuild worn metal parts by UNIONMELT welding

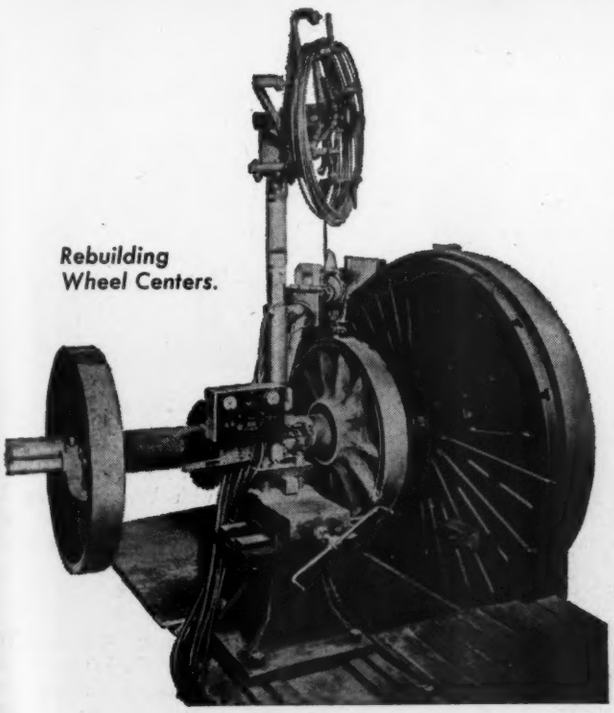
Trade-Mark

Submerged melt welding with UNIONMELT materials and apparatus saves time and money—welding is fast—parts are returned to service quickly—new surfaces are often superior to original—





Left: Rebuilding Multiple Guide. Right: Rebuilding Buffer Casting.



Rebuilding Wheel Centers.

Almost any part that can be suitably positioned can be rebuilt by UNIONMELT welding. It is being used successfully on parts such as buffer castings, plain and multiple guides, locomotive trailer wheels, driving boxes, piercing plungers and crane wheels.

Deposits of almost any thickness can be made of—

High carbon, flame-hardenable steels
Wear-resistant and hard-facing materials
Corrosion- and heat-resistant steels

Using the submerged melt welding process with UNIONMELT materials and apparatus, clean, dense, uniform weld metal can be deposited at the highest known welding speeds. There is no glare, flash, or spatter during welding. When a finished surface is required, the smooth weld deposit needs only minimum machining.

Write for F-7164 which shows UNIONMELT welding work done in railroad shops with OXWELD'S help.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
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Carbide and Carbon Building Chicago and New York
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OXWELD RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

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GOOD RIDING BEGINS
WITH Good Springs
For more than sixty years, American-Fort Pitt Springs have proved that quality in springs goes hand-in-hand with economy. The better the springs the better the ride, less damage to lading, less cost for maintenance, and a smoother journey for the passenger. American-Fort Pitt Springs owe their quality to extraordinarily skillful engineering and design, up-to-date equipment, and automatically-controlled heat treatment. American-Fort Pitt railroad springs meet AAR and ASTM specifications. Write for a copy of the American-Fort Pitt handbook on springs.
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"Better Built"
EQUIPMENT
AMERICAN-FORT PITT SPRING
Division of H. K. Porter Company, Inc.
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For Efficient Annealing
and Stress Relieving . . .
JOHNSTON
CAR BOTTOM
FURNACES
Engineering experience is apparent in the smooth mechanical operation of the Johnston Car Bottom Furnace. Roller bearings in car and door hoist shafts, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.
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Over Thirty Years Experience in the Design and Manufacture of
Burners • Blowers • Furnaces • Rivet Forges
Fire Lighters • Tire Heaters • Allied Equipment
THE JOHNSTON LINE
JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.
ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

Walter I. Buchanan

Spicer organization on March 1, 1948, as assistant sales manager of the service parts division.

◆

VAPOR HEATING CORPORATION.—*J. G. Eliasek* has been appointed by the Vapor Heating Corporation to work with railroads at Richmond, Va., Atlanta, Ga., Wilmington, N. C., and other railroad cen-

J. G. Eliasek

ters in the southeast. Mr. Eliasek, who has been associated with Vapor Heating for several years working out of the main office in Chicago, is now located at Richmond.

◆

BALDWIN LOCOMOTIVE WORKS.—The Baldwin Locomotive Works has announced increased horsepower ratings and increased tractive force ratings on the complete Baldwin-Westinghouse line of Diesel-electric locomotive units, said to be the first major revision on all models since the war. The complete line now includes 800-hp. and 1,200-hp. switchers; 1,600-hp. all-service units with either 4- or 6-wheel trucks and with either 4 or 6 traction motors; a 2,400-hp. road transfer unit, and 1,600-hp. road units. Optional gear ratios are offered in the 1,600-hp. all-service, 2,400-hp. road transfer and 1,600-hp. road units. These changes, the an-

Boss, there MUST be a smarter way...
it's cheaper to wash with #2220. On a Class I railroad, #2220 cut washing cost to only $3.76 per two-unit diesel (cost with other compound—$9.46!) by *cutting man-hour time 62%!* Spray #2220 on, agitate lightly, rinse off, *pocket a big saving.* Ask Turco.
MEN AT WORK

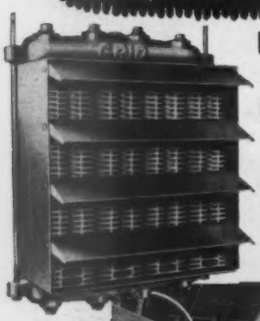
TURCO PRODUCTS, INC.

Railroad Cleaning Compounds

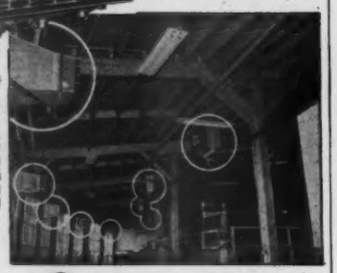
LEARN WHY...

the country's largest RAILROADS are turning to-

GRID FOR HEATING AND VENTILATION!



DIESEL ENGINE HOUSES - ROUND HOUSES - SHOPS, STORES AND OTHER BUILDINGS



Here is GRID Equipment used for both heating and ventilating in round house stalls now adapted for Diesel service.

It's Because-

GRID cast iron construction withstands sulphuric and other corrosive fumes ever present in engine houses.

GRID wide "fin" spacing facilitates easy cleaning—no loss in efficiency by dirt clogged heating sections.

GRID will withstand steam pressures up to 250 lbs.—and is free of electrolysis.

GRID "fins" are cast integral with the steam chamber, assuring even distribution of heat. GRID "fins" can not come loose from the steam chamber to cause loss of heating efficiency.

GRID design incorporating proper fan sizes, motor speeds and outlet temperatures results in a properly balanced heating unit.

CONSULT US ANYTIME

We have spent much time and research, especially in Diesel heating and ventilating . . . and believe we can furnish you the correct answer to this type of heating and ventilating. Write for details . . . no obligation.

Investigate today GRID system of high-pressure unit heaters, blast coils and radiation . . . the answer to maintenance-free heating for railroads.

D. J. MURRAY MANUFACTURING CO.
WAUSAU WISCONSIN

nouncement said, "have been made without seriously affecting the interchangeability of parts between older Baldwin locomotives and the new units."

◆

AMERICAN STEEL & WIRE CO.—*Wilmer H. Cordes*, manager of market development and advertising of the American Steel & Wire Co., has been appointed general staff manager of the firm's sales department to succeed *Paul L. Lindsay*, recently appointed Cincinnati, Ohio, manager of sales.

◆

FAIRBANKS, MORSE & CO.—*Gordon R. Anderson* has been appointed general manager of the Freeport (Ill.) Works of Fairbanks, Morse & Co., and *J. F. Weiffenbach* succeeds Mr. Anderson as manager of engineering of the Beloit (Wis.) Works. Mr. Anderson is a graduate of the University of Michigan in electrical engineering. He joined Fairbanks, Morse at its Indianapolis (Ind.) Electrical Works in 1922 and was transferred to Beloit in 1929. He was

J. F. Weiffenbach

appointed chief electrical engineer in 1932 and manager of engineering in 1946.

Mr. Weiffenbach, also a graduate of the University of Michigan, with a degree in mechanical engineering, joined the Electro-Motive division of General Motors Corporation in 1934 at Cleveland, Ohio, and later served with Electro-Motive at La Grange, Ill., where he was engaged in locomotive engineering and designing. Subsequently he joined Fairbanks, Morse, and was serving as chief engineer of the Diesel locomotive division at Beloit at the time of his appointment as general manager of the Freeport Works.

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*William E. Olds* has been appointed assistant vice-president —sales of the Standard Railway Equipment Manufacturing Company, with headquarters in the company's Chicago offices.

◆

AMERICAN CAR & FOUNDRY CO.—*Ralph F. Koeneman*, assistant chief engineer of passenger cars at the Berwick, Pa., plant of the American Car & Foundry Co., has been appointed chief engineer of passenger car

FOR POSITIVE LEAK-PROOF DIESEL FUEL LINE CONNECTIONS

RECTORSEAL

Available in complete size range and brush top cans.

Proved in use by major companies in the Oil Industry for 13 years—tested in the field wherever threaded, gasketed or coupled connections are required. Rectorseal is the *safe* leak-proof sealant—prevents waste of fuel, reduces fire hazard.

It maintains its plastic elasticity for the life of the connection; never dries out or gets hard and brittle. It's easy to apply. It's economical. It's insoluble in oil, water and all petroleum fractions. Order Rectorseal today. Test it in your own shops. We'll gladly send a free sample.

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Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas

LIMA-HAMILTON SWITCHERS...

Taken at Peoria, Illinois

... on the T.P.&W.

"Lima-Hamilton switchers have
thoroughly satisfied our railroad
in doing the job expected of them ..."

***says the* TOLEDO, PEORIA AND WESTERN**

LIMA HAMILTON CORPORATION

LIMA LOCOMOTIVE WORKS, INC. • *A division of the Lima-Hamilton Corporation* • **LIMA, OHIO**

engineering at Berwick. *John C. Coonley*, formerly assistant works manager of the Heald Machine Company, Worcester, Mass., has been appointed assistant manager of American Car & Foundry's valve division, with headquarters at Detroit, Mich.

◆

WYANDOTTE CHEMICALS CORPORATION.—The Wyandotte Chemicals Corporation has purchased the Pacific Chemical plant of the American-Marietta Company, of Los Angeles, Calif., to provide a manufacturing unit to serve Wyandotte branches in Los Angeles, San Francisco and Seattle, Wash. The plant and sales personnel of Pacific Chemical will be absorbed by Wyandotte's Pacific division and the Wyandotte research and technical service staffs will become available to users of Pacific Chemical products as well as to companies using Wyandotte products.

◆

WILSON ENGINEERING CORPORATION.—The Wilson Engineering Corporation of Chicago has appointed *Don B. Alexander*, Terminal Tower Building, Cleveland, Ohio, eastern representative.

◆

HYSTER COMPANY.—*J. P. Waite, Inc.*, 3304 West Pierce street, Milwaukee 4, Wis., has been appointed dealer for Hyster industrial materials-handling trucks in eastern Wisconsin and northern Michigan.

PERSONAL MENTION

General

W. B. JOHNSON, assistant to superintendent of machinery of the Kansas City Southern at Pittsburg, has been appointed assistant superintendent of machinery, with jurisdiction over the car department. Mr. Johnson remains at Pittsburg. The position of assistant to superintendent of machinery has been abolished.

J. M. PIERCE, superintendent of machinery of the Kansas City Southern at Pittsburg, Kan., has retired after 42 years of service.

L. W. VAN NATTAN, superintendent of Diesel equipment of the Kansas City Southern, with headquarters at Pittsburg, Kan., has been appointed superintendent of machinery, with headquarters at Pittsburg. The position of superintendent of Diesel equipment has been abolished.

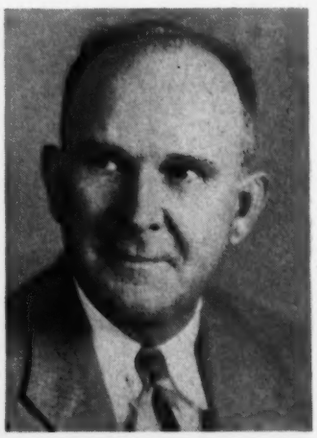
Car Department

E. L. NYLANDER, car foreman of the Chicago, Rock Island & Pacific at Peoria, Ill., has been promoted to superintendent car department, with headquarters at Chicago.

J. T. LUNSFORD, general car foreman of the Texas & Pacific at Texarkana, Tex., has been appointed general car foreman at Fort Worth, Tex.

J. L. PERKINS, general car foreman of the Texas & Pacific at Fort Worth, Tex., has been appointed general car inspector with headquarters at Dallas, Tex.

H. A. MASON, general car foreman of the Texas & Pacific at Dallas, Tex., has been appointed superintendent of the car department, with headquarters at Dallas. Mr. Mason was born on October 24, 1901, at Hughes Springs, Tex. He entered T. & P. service in September, 1925 as a car clerk on the old Denton division. Subsequently he was timekeeper, car checker on



H. A. Mason

the old Rio Grande division and at the Marshall (Tex.) shop, lead carman at Texarkana, Ark., rip-track foreman and wrecker foreman at the Marshall shop, and rip-track foreman at Texarkana. In January, 1942, he was transferred to Marshall as freight-car-shop foreman, and in May, 1946, became general car foreman at Dallas.

Master Mechanics And Road Foremen

D. B. LACY has been appointed master mechanic of the Atlantic Coast Line, with headquarters at Jacksonville, Fla.

W. C. STANCIL has been appointed master mechanic of the Atlantic Coast Line, with headquarters at Rocky Mount, N. C.

LAWRENCE J. BRASHER has been appointed assistant master mechanic of the Belt of Chicago, with headquarters at Chicago.

Shop and Enginehouse

F. HOLLAND has been appointed general foreman of the Atlantic Coast Line, with headquarters at Jacksonville, Fla.

W. V. DEW has been appointed general foreman of the Atlantic Coast Line, with headquarters at Thomasville, Ga.

***SPECIALISTS** in the manufacture of:*
Ideal Sectional Expanders, universally used to expand flue tubes in locomotive flue sheets. The accurately machined, interchangeable sections form a true circle when fully expanded.

Ideal Safety Power Cutters will cut flues off in one revolution, with a clean-square edge for safe ending.

Write for IDEAL CATALOG No. 57

The Gustav Wiedeke Company
DAYTON 1, OHIO